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THE GRASSLANDS OF NEW ZEALAND.

(Continued.)

THE AGROSTIS SPECIES—RED-TOP, BROWN-TOP, AND CREEPING-BENT.

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THERE are few grasses of economic importance more puzzling in form and character than those belonging to the genus *Agrostis*, and there are none perhaps over which a greater confusion exists at the present time in the mind of the farmer, the seed-merchant, the green-keeper, and even the specialized botanist. The names red-top, brown-top, Waipu brown-top, fiorin, twitch, creeping-bent, carpet-bent, velvet-bent, *Agrostis alba*, *A. vulgaris*, *A. capillaris*, *A. canina*, *A. stolonifera*, *A. palustris*, and *A. tenuis* have been variously applied and much confused. The present article has been prepared to clear up this confusion, and it also aims to deal fairly comprehensively with the ecology and agricultural status of the *Agrostis* species as they occur in New Zealand.

There are three distinct and fairly easily recognizable agricultural species common in New Zealand, and in the naming of these the writer is keeping in accord with Piper,* Agrostologist, United States

* U.S. Department of Agriculture Bulletin No. 692, *The Agricultural Species of Bent Grasses*; and personal correspondence.

Department of Agriculture. These three species are: (1) Red-top (*Agrostis palustris*), (2) brown-top, or colonial bent (*Agrostis tenuis*), and (3) creeping-bent (*Agrostis stolonifera*).

Other common and botanical names that have at times been applied to these species are—

(1.) Red-top (*A. palustris*): *A. alba* of most botanists; fiorin of the seed trade; *A. stolonifera* of some merchants' catalogues; twitch.

(2.) Brown-top, or colonial bent (*A. tenuis*): *A. vulgaris* of most botanists; *A. capillaris* (of some American botanists); Waipu brown-top (of Auckland seed-growers and seed-merchants); twitch, or red-top (of Canterbury Plains and South Island generally); *A. canina** (of some merchants' catalogues); Rhode Island bent (of America).

(3.) Creeping-bent (*A. stolonifera*): Carpet-bent (of American green-keepers); fiorin (of Dr. William Richardson, of Moy, Ireland); *A. depressa* and *A. maritima* (of some American botanists).

The species as above defined are by no means single entities. At best all are big aggregates, each containing many puzzling forms. The aggregate species, however, are sufficiently clean-cut to be recognized in the field, and each is confined more or less to a definite habitat. The cause of variation within and between the species is extremely difficult to account for, but it would appear that hybridization played an important part, for it is in areas where the three species may be found together that one notes the greatest variation and often the most puzzling of forms. Again, where the habitat is such as to favour only the one species the growth-form and character of that species becomes more constant. Also, there is affinity between the aggregate species. This affinity asserts itself not so much by a general similarity in the plants, but rather by a manifestation of special features such as the appearance of the long rhizomes in otherwise short rootstock forms, or by the ready stolon development of otherwise non-stolon erect forms. These variations are distinct from habitat variations, which at times are extremely marked—so much so that to define the vegetative growth-form of the species botanically is almost impossible.

From an agricultural point of view the three species mentioned above are economically and ecologically separate and distinct. One is justified, therefore, from such point of view in accepting these three species, and it is hoped that the following descriptions and accompanying illustrations will serve to enable farmers and others to distinguish between them. In the main only macroscopic characters are illustrated—such as may be seen with the naked eye or with a lens magnifying up to ten diameters.

RED-TOP (*AGROSTIS PALUSTRIS*).

General Description.

This is the strongest-growing grass of the three. In habit it is usually erect and somewhat stiff (Fig. 1). The leaves are broad,

* *Agrostis canina* (velvet-bent) is a fairly distinct species resembling in general growth-form creeping-bent (*A. stolonifera*). The plant is not found growing in New Zealand under field conditions.

(All photos by E. Bruce Levy.)

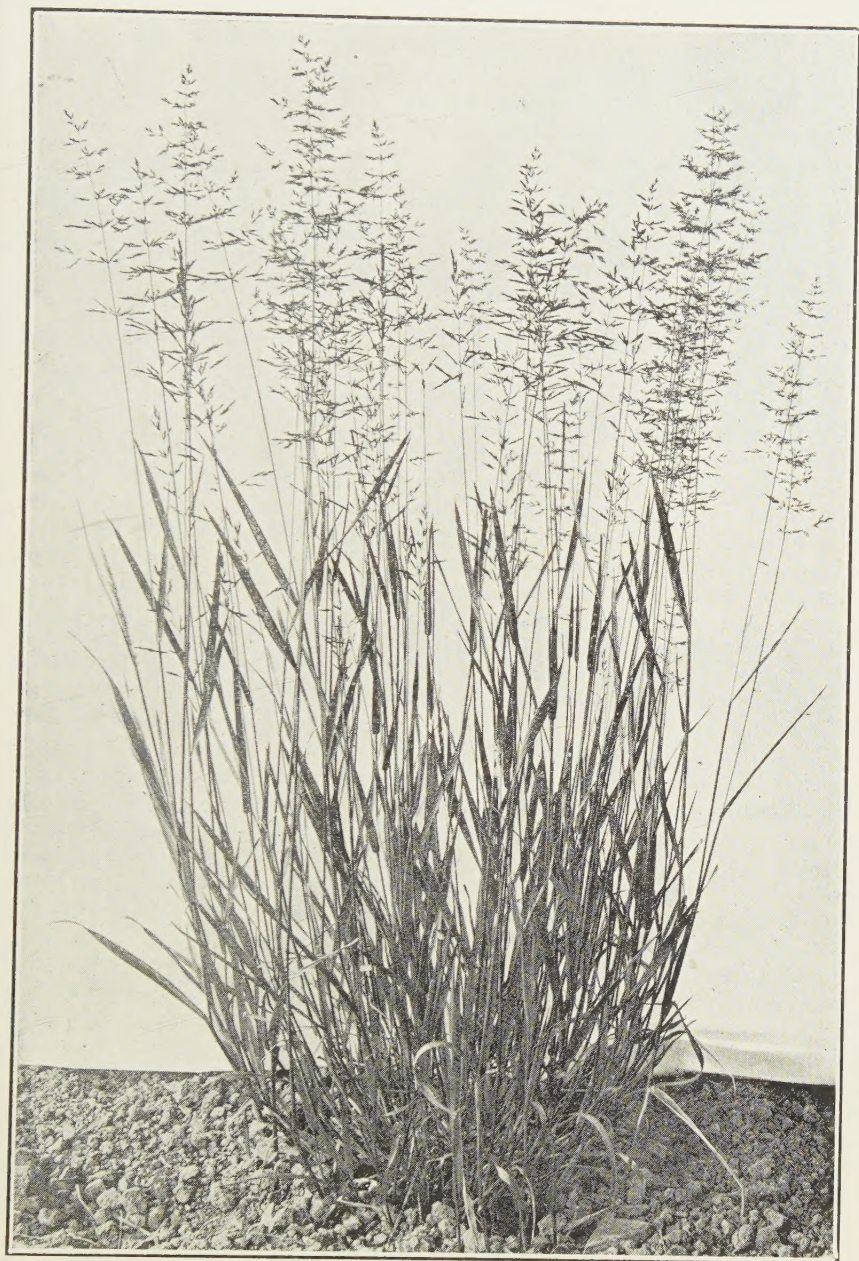


FIG. I. RED-TOP (*AGROSTIS PALUSTRIS*).

$\frac{3}{8}$ in. wide in well-grown specimens, erect when young, drooping when older. The ligule* is large, up to $\frac{1}{4}$ in. long, broad at the apex and often somewhat frayed, particularly on the older leaves (Fig. 2). The ligule of the uppermost leaf on the shoot is very conspicuous, encircling completely the succeeding young leaf while this is still rolled in the bud. The rootstock is stout, and long rhizomes (underground stems) are characteristic (Fig. 3). The rhizomes are many-noded, each node bearing roots, and a bud which may or may not develop. It is on account of these rhizomes that the name "twitch" has been applied to this grass by farmers on arable land. The tillering buds are stout and below ground. The lower ones on the base of the vegetative shoot (crown) usually develop into rhizomes, while the upper ones may form new vegetative aerial shoots. The buds are generally few in number, so that compact many-tillered shoots are rarely found in this species.

The rhizomes push slanting-wise downwards from the crown and extend along at a depth of some 1 in. to 3 in. in the soil, occasionally giving off shoots from buds along the rhizome. More usually, however, the vegetative shoots are borne at the end of the rhizome, which turns up and projects through the ground maybe some 12 in. away from the parent plant. From these terminal aerial shoots numerous roots are given off, which become the functional roots for the upward and seasonal growth of the aerial shoots. The crown of these shoots remains below ground. At first only a single shoot appears, which may or may not be supplemented later by other shoots. It is rather characteristic of red-top that the shoots appear at fairly widely spaced intervals, and that each crown bears only a few aerial shoots. Thus one seldom finds this species forming a dense close turf, but one that is usually very coarse and open. To green-keepers, bowlers, &c., it will be obvious, therefore, why red-top is undesirable as a lawn-grass.

The flower-head (panicle) is fairly characteristic—large, somewhat coarse, with the branchlets arranged in definite whorls. The primary branchlets are usually straight to the tip, and the two secondary branchlets coming off this about half-way along form a very narrow angle with it (Fig. 4). Before and after flowering the whorled appearance is very obvious, but during the flowering-period the branchlets are more widely disposed, expanding before and then compacting again after fertilization. The flowering-culm is tall, up to 30 in. high, and is usually erect, but dense growth may lodge somewhat. The aerial shoots scarcely ever give off branch shoots above ground.

Ecology and Agricultural Status.

Red-top grows best in loose, damp, rather rich soils, but it will thrive and persist for many years on poorer, drier soils, particularly if such soils are periodically worked up with the plough. The growth-form of the plant almost demands a rather loose soil, for such soils give easy penetration to the rhizome, which is the only means

* The ligule is the white membranous structure at the base of the leaf, and is of great value in grass-identification.

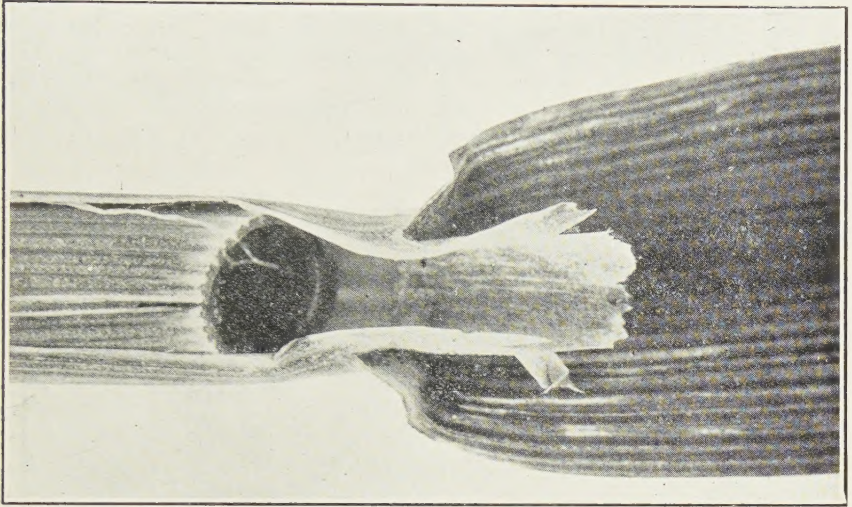


FIG. 2. BASE OF LEAF OF RED-TOP, SHOWING LIGULE. MAGNIFIED 10 DIAMETERS.
The stem has been cut away just below the leaf-base.



FIG. 3. UNDERGROUND STEM (RHIZOME) OF RED-TOP.

Note the stout rhizome and the few vegetative aerial shoots terminating it.
A young rhizome may be seen rising from the crown.

of vegetative spread that this grass has. So long, then, as the ground containing red-top is kept loose by working or by the peaty or loose nature of the soil it will persist for years, but so soon as consolidation is effected the growth becomes more stunted and the shoots become more sparse and slender; and if it is competing with a grass more at home on this consolidated soil the red-top almost invariably will be ousted from that soil. In New Zealand



FIG. 4. FLOWER-HEAD (PANICLE) OF RED-TOP (ON RIGHT) AND BROWN-TOP (ON LEFT), BOTH IN FULL FLOWER.

Note the straight branchlets of red-top and the angled ones of brown-top.

many tons of red-top seed have been sown over a wide range of soils, but the grass to-day nowhere predominates in any old-established pastures. In waste places, particularly throughout peat-swamp lands, it may be frequently seen; and on arable land it at times proves very persistent, being there one of the worst twitch weeds. In these cases the loose nature of the soil is largely responsible for its persistence.

On the hill country in Taranaki red-top sown years ago is still persisting, but the plants are poor and spindly and productive of very little feed. Its persistence at all there is due to the rather loose nature of the soil, the rather heavy rainfall, and the lack of competition of close turf-forming grasses. On the poorer, heavier, and more consolidated soil red-top will not persist in the permanent pasture. On these soils brown-top or danthonia are almost certain to replace the red-top. A good example of this recently came under the writer's notice. Specimens from three fields near Masterton were received at the Laboratory for determination of species. Of these fields one was sown down twelve years ago with fiorin from Germany, and the other two were sown twenty-five years ago with red-top. All the specimens sent in were brown-top. Brown-top is a truly successional species on nearly all the good second-class soils of the Wairarapa, and red-top even if sown there would apparently go out in the course of time before the brown-top advance. This also will be very largely true of the heavier soils in New Zealand generally—those of Southland, the gum-lands of North Auckland, the heavy clays of the Marton district, and those of the Wairarapa may be mentioned; but if these lands are worked and not allowed to consolidate, then the red-top will persist.

Agriculturally red-top is of no significance in New Zealand, and in the writer's opinion not a pound of seed of this grass should be imported into the country. It may have a place on certain wet, peat-swamp lands, but, generally speaking, better grasses may be successfully introduced there. The seed is frequently used as a component of lawn-mixtures, but as a lawn-grass it ranks as one of the poorest. It may act as a quick cover for the first year or so, but perennial rye-grass would be much better for this purpose. Many grievous errors have been made by seed-merchants in contending that agriculturally red-top or fiorin is to all intents and purposes the same as brown-top, and the former has been often supplied instead of brown-top for hill-country sowings and for lawns. A greater mistake than this could not be made; red-top is practically useless on hill country or on lawns, whereas brown-top is one of the best grasses. The seeds of these two species certainly are alike, but the habits and growth-form of the plants are essentially different.

BROWN-TOP OR COLONIAL BENT (*AGROSTIS TENUIS*).

General Description.

Brown-top (Fig. 5) is a finer grass than red-top. In habit it is usually erect, but trailing shoots and slanting divergent shoots are quite a common feature, particularly in plants that have room to spread. In close-turf forms the shoots are mostly erect, and the closer the turf the finer the foliage. The leaves vary from extremely fine blades up to $\frac{1}{4}$ in. wide; they are erect when young, but come later to occupy a position almost at right angles to the culm. The ligule is short (Fig. 6), scarcely ever exceeding $\frac{1}{16}$ in. long, and in the uppermost leaf hardly noticeably enfolding the succeeding young leaf while rolled up in the bud. Until one knows the plant by eye this short ligule is the best ready means of distinction in the vegetative

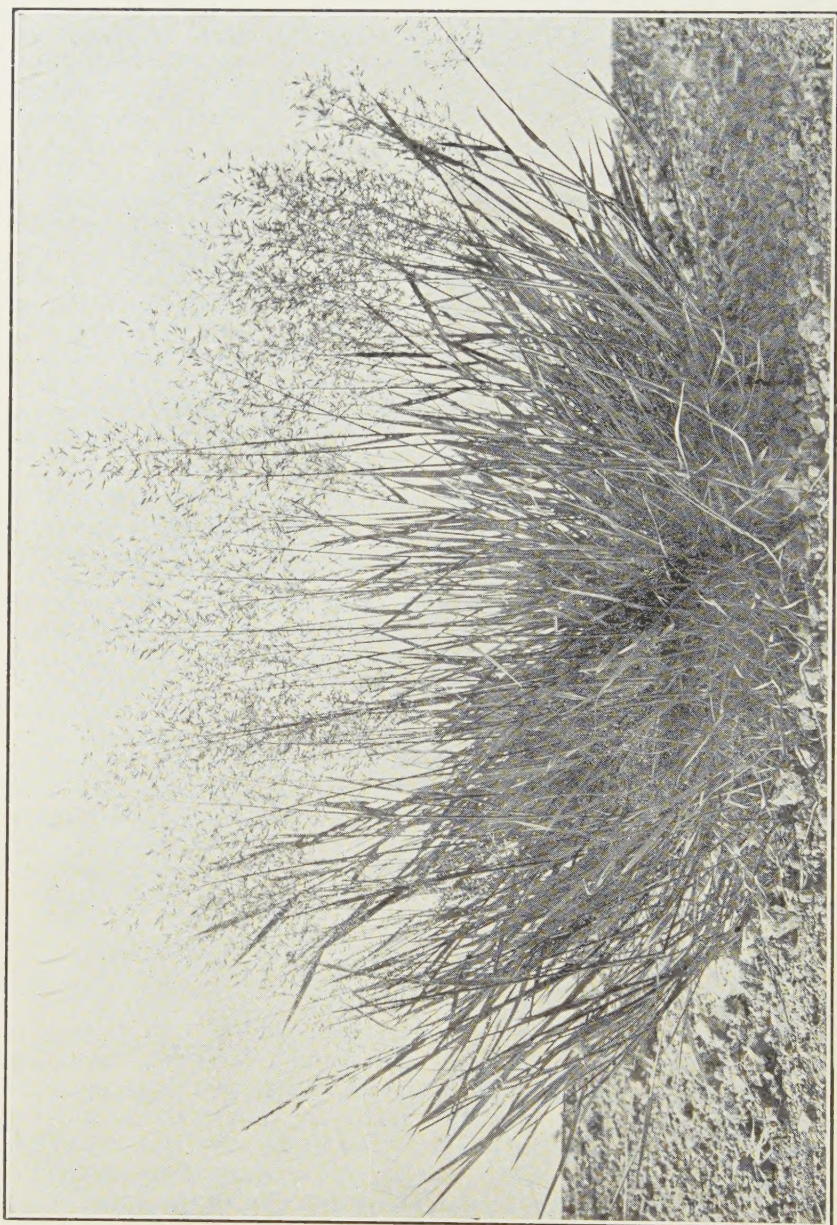


FIG. 5. BROWN-TOP OR COLONIAL BENT (*AGROSTIS TENUIS*).

stage. The rootstock is more slender than in red-top, and long rhizomes are not characteristic when the grass is in the turf form (Fig. 7); but while the grass has room to spread, as in a newly worked field, then rhizomes up to 8 in. long may be formed. On account of these rhizomes, as in the case of red-top, the name "twitch" has been applied to this grass by farmers of arable land, particularly in the South Island. As the ground becomes more consolidated so the length of the rhizome becomes shorter, until in a close turf they become merely short underground stems diverging somewhat from the last year's crown. The tillering buds are borne on these short stems below the ground. When growth commences in the turf condition these buds develop into aerial shoots, almost erect from the crown, with the result that a close turf is formed, and the closer and more numerous these shoots the finer does the turf become.

The rhizomes when formed are somewhat slender compared with those of red-top. They are many-noded, each node bearing roots and a bud, which bud may or may not develop. When these rhizomes are short, adopting really more or less the form of a widely divergent underground tiller, it is usual for all the buds to develop into aerial shoots. On the other hand, if the soil conditions are loose certain of the buds develop into rhizomes. This rather emphasizes the close relationship of the aerial shoot to the rhizome, and the latter would appear to be a one-time aerial shoot that took to the earth to assist the plant in its colonization of light, free, and open soils, or possibly to avoid extinction during periods of drought. In the development of the rhizome red-top would seem to have advanced beyond brown-top as regards this modification, so much so that if conditions are now made such that red-top cannot form these rhizomes the plant rapidly declines and goes out. Brown-top, on the other hand, thrives as well without the rhizome as it does with it, just so long as the fertility of the soil is maintained. Again, in brown-top a very noticeable feature under somewhat shady conditions is the development of aerial shoots bearing lateral shoots. Such shoots undoubtedly will be the homologue of the rhizome.

In brown-top, also, there are frequently found trailing overground shoots which readily root at the nodes whenever these contact the soil, and from such rooting nodes there readily develops an aerial shoot. This character shows somewhat clearly an affinity of brown-top to the third species, creeping-bent. In growth-form, therefore, brown-top is essentially intermediate between red-top, on the one hand, and creeping-bent on the other. As in the case of red-top, each rhizome or underground tiller forms shoots above ground singly at first, but this shoot is soon augmented in brown-top by numerous other shoots rising from the shoot-base (the crown) well below the soil-surface. Thus is formed a dense little tuft of many shoots. These each tiller further the next season, and there soon comes to be formed a dense turf of fine foliage. This dense turf-forming attribute has made brown-top one of the foremost grasses for all manner of playing-greens. To this attribute also is due its success as a bare-ground coverer and sward-former on agricultural (including pastoral) land, placing it as one of the best second-class grasses we have for steep hill country.

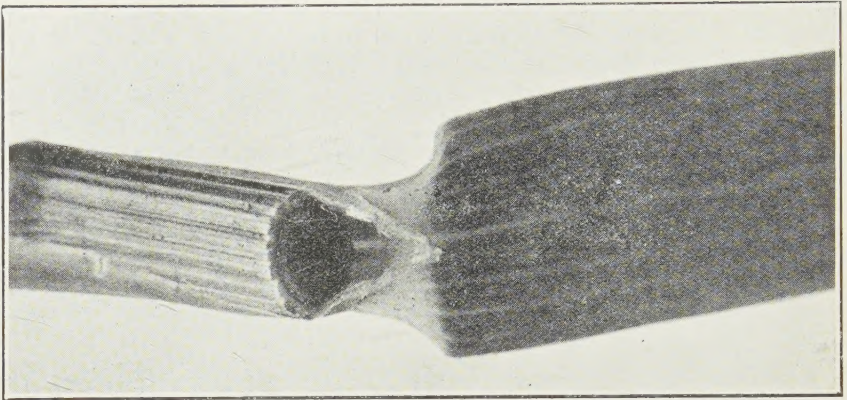


FIG. 6. BASE OF LEAF OF BROWN-TOP, SHOWING LIGULE. MAGNIFIED 10. DIAMETERS.
The stem has been cut away just below the leaf-base.



FIG. 7. UNDERGROUND-STEM SYSTEM OF BROWN-TOP.

Note the numerous vegetative aerial shoots terminating the more slender rhizome (cut short). A subsequent short rhizome has sprung from the crown.

The flower-head (panicle) is characteristic, fairly large, outspreading and fine (Fig. 8). The branchlets are arranged in whorls, but are so disposed that to all intents and purposes the whorled arrangement does not appear as such. The main-branchlet axis is not usually straight to the tip, but is divergent at an angle equal to that made by the secondary branchlets coming off it (Fig. 4). It is this more widely divergent arrangement of the secondary branchlets of the panicle that destroys the whorled appearance. After flowering the



FIG. 8. FLOWER-HEADS OF BROWN-TOP.

That on the left is in full bloom ; that on the right is closed somewhat after fertilization has taken place.

panicle may remain fine and open, particularly in warm sheltered spots, but usually the panicle closes up somewhat, especially if the weather is dry and windy at time of flowering (Fig. 8).

The flowering-culm is fairly tall, but not so tall as in red-top (Fig. 9). The flowering-culms are numerous, and present a fine glossy shivery mass of bloom somewhat reddish-purple in colour. After flowering, however, the colour turns to a dull straw colour, and the whole stiffens somewhat in appearance.

Ecology and Agricultural Status.

Brown-top is by far the most common *Agrostis* species in New Zealand, and, agriculturally, it is the most important. Right throughout the country on all the rather heavy, better second-class soils brown-top is a truly natural successional species—succeeding to the better-class grasses and clovers (rye-grass, red clover, &c.) as these go out. The writer looks upon the fact of brown-top growing well as an indication of average first-class short-rotational grassland soils. It marks soil on which perennial rye-grass will persist for about three years. Stiff heavy soils are the most suitable for brown-top, and the grass demands a good deal of moisture—in fact, the moisture factor is



FIG. 9. TURF OF BROWN-TOP AND RED-TOP GROWN FROM A MIXED LINE OF SEED.

The tall coarse heads are those of red-top, the short finer shivery ones those of brown-top.

more important than is the nature of the soil. Brown-top will persist on fairly light dry soils, but on the latter it is very inclined to dry out in the summer or to get sod-bound, so that the yield becomes very low.

The districts most suitable and where brown-top is most prevalent at the present time are the North Auckland better-class gum-lands, the heavy soils of the Wairarapa, Manawatu, Westland, Southland, and north Otago, together with a belt running along the foothills of the Alps in Canterbury. The grass extends in altitude from sea-level up to 3,000 ft., being found in the Mount Cook region and on the volcanic plateau of the North Island. Higher-altitude forms, however, differ slightly from the lowland forms.

On ploughable country, excepting on the poorer second-class soils, brown-top is not looked upon with favour by the farmer as a good grazing proposition, and there is no doubt that it is inferior to the cocksfoot and crested-dogtail sward which it is possible to maintain on these soils when ploughable. Brown-top growing well is a sure indication that the soil there is perfectly adapted for the cocksfoot, crested dogtail, and white clover type of pasture. It has been stated above that the fact of brown-top thriving indicates soil on which perennial rye-grass will last about three years—that is, under ordinary existing management of pastures. In the Department's Bulletin No. 107* it is pointed out that there are four methods of grassing short-rotational grassland soils, one being by the transitional system (pp. 52–56). If certain species were included in the rye-grass pasture sowings under this system those pastures could remain more than three years and yet not run to weeds. The establishment of a very extensive market for brown-top seed in America, together with the fact that the grass itself is a good second-rate one, should make this system of grassing our better second-class soils more and more remunerative.

On third-class soils brown-top may be used to occupy the land tentatively—that is, until it is gradually replaced by certain other slowly establishing but more permanent species. *Danthonia* or *paspalum*, for instance, are extremely slow of establishment on poor country, and take a long time to form a close sward. Brown-top if included in the mixture will hold such soils after the rye-grass, cocksfoot, &c., have run out and until the *danthonia* or the *paspalum* replace them.

As already mentioned, brown-top, like all turf-forming grasses, is inclined to become sod-bound, and the poorer and drier the soil the more quickly does this come about.†

For hill-country pastures where the rainfall is fairly high brown-top ranks as one of the most important grasses. Owing to its fine seed it establishes readily, and with its penetrating underground-stem systems it ramifies through pukahu and tree-fern stumps, &c., occupying those spots in the bush-burn where ordinarily it is extremely difficult to get other grasses to take; and such spots, it must be remembered, are usually the places for the establishment of the fern-growth which proves so troublesome in the hill-country pastures. Brown-top on hill country really should occupy that grade of soil between the cocksfoot, crested dogtail, and white clover soil-type and the *danthonia* soil-type. All the Taranaki back-country, and the hill lands of the King-country, of North Auckland, of Westland, of Southland, and practically all moderately moist hill country in New Zealand, should have brown-top sown in addition to *danthonia*, and the better grasses—cocksfoot, crested dogtail, *Poa pratensis*, &c.

* *The Grasslands of New Zealand, Series I, Principles of Pasture-establishment*, by E. Bruce Levy. In future articles reference will often be made to this publication (a consolidation of articles which have appeared in the *Journal*), and readers interested in these grassland articles should secure a copy from the Department of Agriculture, Wellington (price 1s.).

† In a future series of articles on pasture-management the writer will deal with the problem of renovation of sod-bound pastures.

Brown-top is now becoming recognized as the most suitable of grasses for all manner of turfed playing-grounds, and practically all the brown-top seed sent out of New Zealand to America is used there in the formation of these greens. Up to the last few years it has been held that brown-top was confined to the North Auckland district, where the seed was harvested and sold under the name of Waipu brown-top. During the last three years the writer has made a very intensive study of the *Agrostis* species in New Zealand, and specimens have been collected * from all over New Zealand and grown at the Biological Laboratory alongside plants raised from type seed from America. It can now be said with certainty that brown-top is the common form of *Agrostis* in New Zealand, and that the form growing in the South Island and other parts is identical with that growing in North Auckland. For lawns and playing-greens there is no doubt that brown-top is the grass *par excellence*, producing as it does a very fine and even turf, and being sufficiently hardy to stand the severe conditions of wear and close cutting that many greens are subject to.

It has been stated before that red-top is extremely poor as a lawn-grass, and in sowing down lawns care should always be taken to ensure that the brown-top seed used is free of red-top. On heavy clays this is not so important, but on loose soils the red-top will persist and cause trouble by its rather stiffly erect shoots. Brown-top seed for export purposes should be entirely free of red-top.

CREEPING-BENT (*AGROSTIS STOLONIFERA*).

General Description.

The characteristic feature of this grass is its long trailing overground stems (stolons) (Fig. 10), which root at the nodes whenever these come into contact with the slightest moisture (Fig. 11). From the rooted nodes an aerial erect shoot is given off. At the base of this shoot tillers may be formed, the lower ones at least of which will develop into the trailing overground stems. Under close turf conditions the tendency to form long trailers is somewhat reduced, and then numerous rather fine erect shoots are formed, which under close grazing or close mowing form a dense turf. Just so soon, however, as the turf is allowed to get away the stolon habit reasserts itself, and there may be formed a dense mat of intertwined stolons each sending up shoots at the nodes and forming a regular carpet. The American agrostologists have, in fact, in one publication called this grass the "carpet-grass." The rootstock and crown are entirely above ground, and there is no formation whatsoever of underground rhizomes.

The leaf is a trifle paler green in colour than that of brown-top, somewhat shorter and stout, tapering gradually from the base to the apex. On the older portion of the shoot the leaves are lax and somewhat drooping; towards the tip of the shoot they are stiffer and usually closely appressed towards the stem, thus forming with the latter a very narrow angle. The ligule is long and somewhat pointed, usually exceeding that of red-top in length, but being much narrower

* In the collecting of these *Agrostis* species the writer is indebted to several officers of the Fields Instruction Service for their assistance.

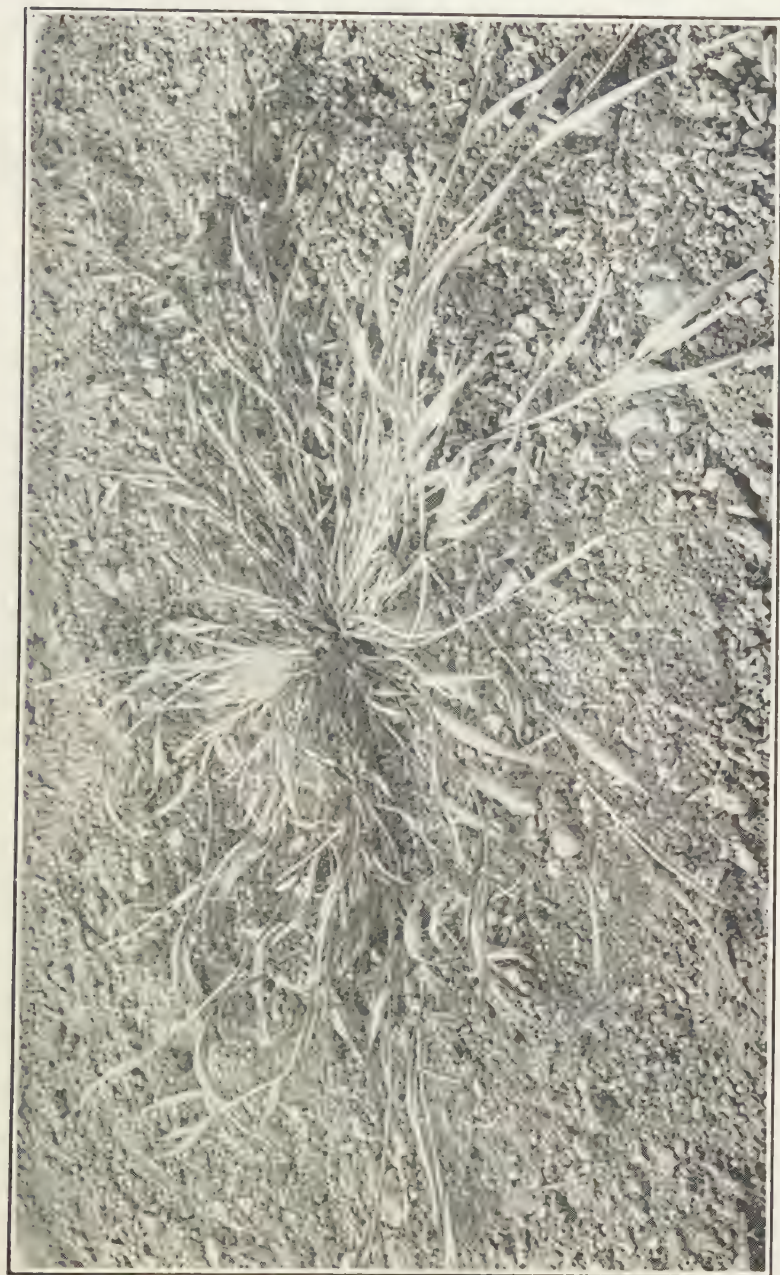


FIG. 10. CHIFFIN, BEN. (AGROSTIS STOLONIFERA).

Young plant showing characteristic overground trailing stolon.

and less frayed at the tip (Fig. 12). The ligule of the uppermost leaf is readily discernible, enfolding the young succeeding leaf while this is rolled up in the bud. This long white membranous ligule readily distinguishes creeping-bent from brown-top, and the growth-form resembles in no way that of red-top. The flowering-culm is scarcely ever strictly erect, being curved and kneed at the nodes. The panicle (Fig. 13) is usually short and smaller than that of red-top or brown-top; it is somewhat open when in flower, but readily compacting to a close almost spike-like form, the branchlets being compressed close in to the main axis or rachis of the panicle.

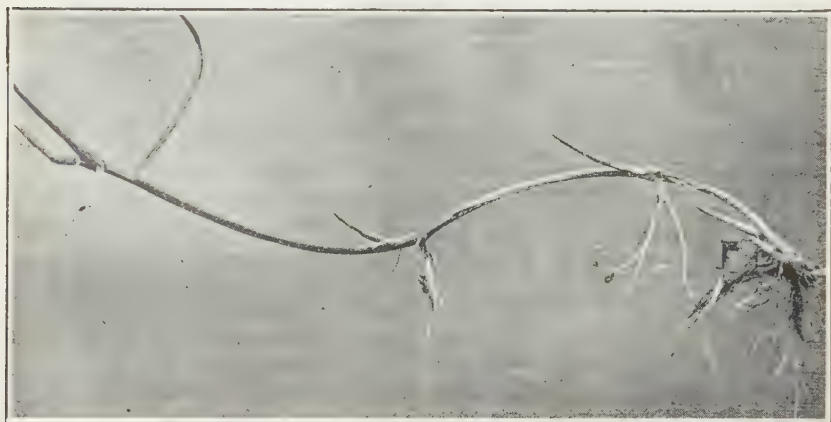


FIG. 11. ROOT-SYSTEM OF CREEPING-BENT.

The creeping overground stem roots freely at the nodes wherever moisture is present.

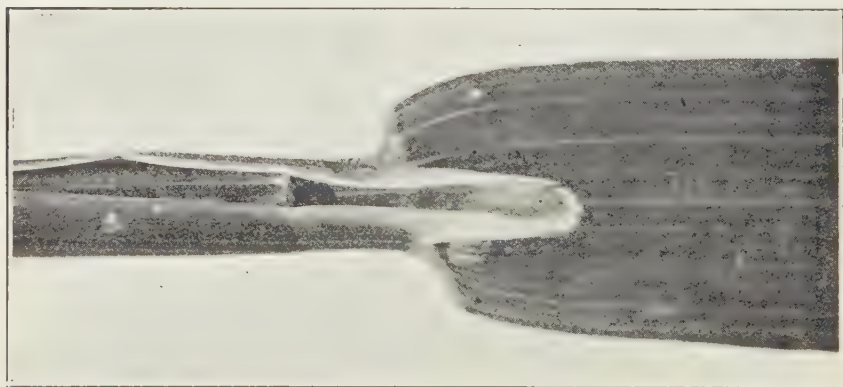


FIG. 12. BASE OF LEAF OF CREEPING-BENT, SHOWING LIGULE. MAGNIFIED 10 DIAMETERS.

The stem has been cut away just below the leaf-base.

Ecology and Agricultural Status.

Creeping-bent is widely distributed throughout New Zealand, but agriculturally it is of minor importance only. Its habitat is very confined, the ideal situation for its greatest growth being in wet somewhat waterlogged soils. It is commonly found on hillsides bordering springs; in fact, wherever the soil is moist at the surface for the greater portion of the year there will creeping-bent be found, providing that the vegetation in those spots is somewhat sparse and open.

Creeping-bent will not compete successfully with other grasses that are stronger-growing and which form a fairly dense cover. On the



FIG. 13. FLOWER-HEADS OF CREEPING-BENT.

That on the left is in full flower; those on the right show the typically compacted panicle after flowering.

richer portions of the Hauraki Plains, for example, it is the common grass on the roadsides, but through the fences inside the paddocks, where the rye-grass and meadow-foxtail type of pasture prevails, creeping-bent does not enter in to the pasture sward. The grass will stand inundation of flood-waters for weeks at a time, and it grows freely in water up to 6 in. deep, but deeper submersion than this for any length of time will kill it. The grass associates at times with brown-top where this grass is thinned out somewhat through being in situations a little too wet for its growth. Creeping-bent is also at times to be found in closely grazed damp pastures.

The herbage produced by creeping-bent is small in quantity and is not particularly palatable to stock. In Ireland Richardson commercialized this grass under the name of "fiorin." Seed could not be obtained, but the grass was vegetatively distributed, the long trailing stolons being cut into short lengths. Each length containing a node will readily form a new plant when strewn on damp soil. Richardson claimed a great yield from this grass on the bog-lands of Ireland, but in New Zealand the yield is never high, and, generally speaking, the soils that would produce big crops of creeping-bent here are utilized for the production of more palatable grasses such as meadow-foxtail, *Poa trivialis*, timothy, &c.

The seed of creeping-bent has never been placed on the market, but German mixed bent, which is mainly brown-top, regularly contains about 1 per cent. of creeping-bent. Its presence in commercial lines enhances the value of German brown-top seed in the estimation of American green-keepers. The name "fiorin" has come to be associated with imported red-top by the seed trade. Formerly it was applied to seed from Germany, but now is more generally used for all imported red-top seed.

As a playing-green grass creeping-bent is very popular at the present time in America, where putting-greens, &c., are laid down with it, the vegetative method of propagation being adopted. Under liberal top-dressings of soil and with a plentiful supply of water creeping-bent can be made to produce a very fine and even turf. Without this attention, however, it is of no use as a fine playing-green grass. If the runners are allowed to form above ground a matted, uneven, and spongy turf is formed, which also readily dries out with hot weather. The effect of soil top-dressing is to cover up any trailing stems, and so keep the crown below the surface. If this soil top-dressing is not regularly done the grass becomes objectionable. As a general-purpose playing-green grass creeping-bent does not compare at all favourably with brown-top.

CONCLUSION.

The foregoing is a general classification of the *Agrostis* species in New Zealand. Each species is more or less an aggregate, in itself ecologically and economically distinct from the other two. There are many intermediate floristic forms, but to separate these would, the writer feels, further confuse the *Agrostis* position in New Zealand rather

than elucidate it. If in the future course of these grassland studies one form is met with that shows qualities above another, then it will be time enough to subdivide any one of the three existing well-defined aggregate species here dealt with.

(Series to be continued.)

GERMINATION OF AGRICULTURAL SEEDS.

NEW ZEALAND OFFICIAL TESTS, 1923.

THE following table shows the average germinations of agricultural seeds tested at the Department's seed-testing station during the calendar year 1923. The figures are compiled from the analyses of approximately 10,000 commercial samples in that period.

Seed.	Average Germination.	Seed.	Average Germination.
<i>Principal Seeds.</i>			
	Per Cent.		Per Cent.
White clover	90.8	Prairie-grass	64.2
Alsike	90.3	Crested dogstail	90.3
Cow-grass	92.5	Cocksfoot*	70.0
Crimson clover	88.1	Paspalum	29.5
Lucerne	91.8	Oats	84.9
English trefoil	74.4	Peas	92.9
Lotus major	80.3	Turnip	87.8
Lotus angustissimus	53.0	Swede	85.3
Perennial rye-grass	81.1	Rape	91.2
Italian rye-grass	85.0	Kale	88.4
Western Wolths rye-grass	84.4	Mangold	147.3
Timothy	93.7	Mustard	86.1
Brown-top	80.0	Carrot	69.5
Red-top	86.2	Perennial rye-grass by dis-	
Fiorin	89.0	tricts—	
Chewings fescue	87.7	Southern	78.8
Meadow-fescue	71.5	Canterbury	84.2
Meadow-foxtail	31.4	Sandon	78.3
Danthonia	38.7	Poverty Bay	92.5
Poa pratensis	55.3	Hawke's Bay	93.7
<i>Less Common Seeds.</i>			
Suckling-clover	68.6	Chou moellier	88.0
Subterranean clover	62.6	Maize	89.8
Strawberry-clover	80.6	Tares	94.5
Japanese millet	91.1	Vetch	99.0
Poa trivialis	21.0	Lotus hispidus	77.0
Sorghum	60.3	Black-skinless barley	80.6
Yarrow	84.7	Cape barley	76.5
Yorkshire fog	89.4	Rye-corn	88.0
Indian doob	84.0		

* Akaroa, 68.2; Plains, 79.8; Danish, 72.8 per cent.

—Nelson R. Foy, Biological Laboratory, Wellington.

CIDER-MAKING.

PRACTICE FOR NEW ZEALAND CONDITIONS.

J. C. WOODFIN, Vine and Wine Instructor, Horticulture Division.

WITH the increasing production of apples in the Dominion, and the high standard required in grading both for export and the home market, it is becoming more and more necessary to make profitable use of both the surplus apples in years of superabundance and of those apples which, though otherwise good and sound, are debarred from the higher grades by slight blemishes.

Owing to the facility with which large quantities of fruit can be converted into a most palatable and wholesome beverage, which will keep for years when well prepared, and of which the overproduction in years of plenty can be utilized to level up the stocks in years when the crops are below the average, the manufacture of cider may be looked upon as a most important safety-valve for the New Zealand apple industry.

Much of the cider manufactured in this country has hitherto been prepared by "rule of thumb" or more or less haphazard methods, which if carried out on a commercial scale would soon lead to disaster. This article has been prepared with a view of assisting orchardists and others who wish to undertake the manufacture of cider in avoiding such results, by aiding them to produce by scientific methods a first-class uniform article, clear and bright, with good flavour and keeping-qualities, which should meet with a ready sale.

Comparatively few people in this country realize what a delicious beverage a well-prepared light cider is, the experience of cider being more generally confined to partaking of one of the numerous concoctions sold under that or similar names, made with artificial flavouring and colouring-materials and artificially carbonated to produce effervescence. The education of the public as to the value of cider as a pleasant drink of low alcoholic strength, and the therapeutic value of dry cider in cases of rheumatism, gravel, gout, and kindred ailments, should be the aim of the cider-maker or merchant when placing the cider on the market.

There are several varieties of cider, both draught and bottled, which differ in their methods of preparation. These are known as dry cider—still or sparkling—in which most of the sugar has been transformed by fermentation into alcohol and carbon dioxide; sweet sparkling cider, in which sufficient sugar remains untransformed; and champagne cider, prepared by the same methods as champagne wine is in France. The manufacture of these different varieties will be explained hereinafter.

THE CHOICE OF APPLES.

The value of New-Zealand-grown apples from a cider-making point of view has not been systematically tested, but excellent cider has been produced from Cox's Orange, Delicious, Sturmer, and Worcester Pearmain apples fermented alone or blended with other varieties.

There is a large field for local experiment in selecting the most suitable varieties and blends of varieties for making cider, and the placing of the acquired results before cider-makers, so that they may have a basis on which to manufacture with a prospect of making a payable article from the beginning, without having to take the risk of experimenting in the early stages.

Apples grown specially for cider will improve if left on the trees as long as possible. It is during the latter part of their vegetative life that their agreeable flavours develop. It is generally conceded that the varieties which mature during the latter part of the season, and whose juice is fermented during the winter months, furnish the highest-grade ciders.

The apples should be ripe, perfectly clean, sound, and free from mould and earthy flavours acquired through lying too long on the ground. The inclusion of a small proportion of overripe apples which are turning brown will not be detrimental to the quality of the cider—in fact, juices in which they are incorporated have a tendency to clear more rapidly than those in which they are omitted. Too large a proportion, however, affects the flavour and makes the cider dark in colour, which is generally considered undesirable.

MATURING AND BLENDING.

To obtain the best results in the palatableness and keeping-qualities of the resulting cider the apples should be milled when the maximum of aroma, flavour, and sugar content is reached—when, in fact, they are at their best for eating purposes.

The skin of the ripe apple should have a dry and slightly wilted appearance, and the pips a dark-brown colour. When the ripe apple is pressed with the thumb it should yield with a slight crackle, but not feel mushy. The ripening process, which includes the transformation of starchy and other matters into sugar, should be followed closely, as there is a considerable difference in the sugar content of partly ripe apples and that of apples which have reached their maximum of ripeness. The density of the juice, which does not quite correspond with the absolute sugar content—though near enough for practical purposes—should be tested with a hydrometer from time to time until no further increase is noticeable, when, other conditions being favourable, the fruit will be ready for grinding. This should not be delayed too long, or the apples will become mushy and the process of extracting the juice more difficult.

Freshly gathered apples are rarely sufficiently ripe or mellow to be converted into cider at once; even the early varieties can be improved by leaving them on the ground, in favourable weather. This, however, should be avoided wherever it is possible to store them under cover, as in rainy seasons the apples may lose some of their saccharine contents and also acquire an earthy flavour, besides being rotted by excessive humidity. Under cover they should be separated from the soil to prevent their being contaminated, and so that the air can circulate freely both underneath and through them. This can be attained in several ways—for instance, by covering the soil with loose boards raised on fairly high cross-pieces, or by covering the floor with a layer of manuka and straw. The apples can be placed in

heaps not deeper than 2 ft., with air-shafts formed of small bundles of manuka placed at intervals to facilitate free ventilation. Apples placed in large piles are liable to heat and ferment. Where bushel cases are available the fruit can be stored in these and placed under cover, with the cases piled up as they are in cool storage. In fact, this will probably be found to be the most convenient and economical method of keeping them. The French cider-makers generally mature their apples in a loft above the cidery, and feed them down to the mill by gravitation. Whichever plan is adopted it will be found advantageous to store each variety and the varieties of each of the ripening-periods separately, so as to facilitate the handling of them when required for the mill.

In the older cider-making countries, among which France leads with an annual average production of 404,118,000 gallons (period 1904-13), special cider apples suited to the climatic and soil conditions are grown. Some of these varieties make good cider by themselves, but the general rule is to blend the different varieties so as to combine the necessary proportions of acid, sugar, and tannin to produce a good keeping and palatable drink. Experience has proved that a better fermentation and resulting cider are obtained in this way than by blending the cider produced from different varieties of apples fermented by themselves, though this course is necessarily followed in blending the ciders made during different ripening-periods or in different years.

The question naturally arises here as to what proportions of sugar, acid, and tannin the juice of an apple should contain to produce a good cider. There is no exact formula of the proportions of the chemical ingredients of apples by following which a good cider can be made. It is known, however, that finished ciders lacking in alcohol, acidity, or tannin are generally of poor quality and flavour, and are subject to deterioration. The composition and amelioration of the finished cider will be considered later.

Good cider can be produced from apples and blends of apples containing very different proportions of sugar, acid, and tannin, and, with the exception of the saccharine contents of the apple-juice, these ingredients are not found in the same proportions or equivalents in the finished cider. It is evident from these considerations that personal taste plays a large part in the selection of suitable apples for blending, and the following approximate composition of the juice of a suitable blend should only be taken as a general guide: Density, 6 to 10 Baumé (1.0434 to 1.0744 specific gravity); total acidity as malic acid, 0.3 to 0.6 per cent.; tannin, 0.2 to 0.5 per cent.*

The best criterion on which to base the choice of apples, and the proper proportions of the different varieties to be used for blending purposes, is furnished by the cider produced from them. It is therefore essential, in order to arrive at manufacturing a standard article, to take note when preparing the apples for the mill of the names and quantity of each variety and their respective qualities, the nature of the soil and situation in which they were grown, and of all other factors

* It is the intention of the writer to later prepare matter for the use of cider-makers and wine-makers, giving simple instructions for the analysis of the most important ingredients of fruit-juices and the ciders and wines made from them.

which, in the cider-maker's opinion, are susceptible of modifying the finished product. By comparing the finished ciders the maker can ultimately select a suitable blend of fruit for the manufacture of a high-class cider of distinctive qualities, acceptable to connoisseurs and the majority of consumers. Only those varieties which attain their maximum sugar content at the same period should be blended.

Owing to the difference in climatic conditions the constituents of the same varieties of apples grown on the same soil may vary considerably from one season to another, and the same varieties of apples produce qualities of cider varying with the composition and aspect of the soil the apples were grown on.

MILLING AND PRESSING.

The object of grinding or milling the apples is to rupture the cells containing the juice, so that the maximum of juice can be extracted when the pomace is placed under pressure. Small quantities of apples can be mashed in a tub and the pomace placed loosely in a previously boiled, clean onion-bag, which can either be twisted or placed between two boards and pressed with an improvised lever to extract the juice. Such methods, of course, cannot be considered when it is intended to produce cider on a commercial scale, though for the production of a few barrels the lever principle can be applied by fixing an iron or wooden bar in a hole cut in a tree or in a wall, with the fulcrum placed on the cheese built up of pomace, and the long arm of the lever weighted with a sack of earth or other convenient weight. A press made on this principle should cost very little, and has an advantage over a screw-press in that it keeps up a continual pressure as the juice escapes and the pomace sinks.

Very convenient and compact small hand-operated cider-mills are made, combined with small screw-presses. These are very suitable for producing two or three barrels of juice per day. Larger power-mills and presses, both screw and hydraulic, suitable for factory work, are made, capable of extracting from ten to three hundred barrels of juice per day.

Most of the large commercial cider-makers in England and France use the grater type of mill. These are made with a wooden or metal cylinder fitted with corrugated or saw-like blades, which grate or rasp the apples against a metal concave or shoe, so regulated that the apples are reduced to a finely divided pomace without crushing the pips, which would give an undesirable flavour to the cider.

The old method of building up the cheeses with straw or rushes is seldom employed at the present day. The modern method of building up a cheese consists in placing a rack made of wooden laths or basket-work on the bed of the press, or on the bed of a truck on which the cheese is built up under the mill and run on rails to the press when completed. A square form, 3 in. or 4 in. deep, is placed on the rack, and on this a stout open cloth or netting, made of cotton or some other strong fibrous material, is laid diagonally over the form, allowing the corners to fall over the sides and ends. The pomace is then run into the form. If falling direct from the mill it is liable to pack hard, and should be moved away from the centre to the corners, which should be well filled in. The finished layer of pomace should be quite level.

The corners of the cloth are now folded over the pomace (not too tight), the form raised, and another rack placed on the layer just completed. On this the form is placed and the operation repeated until the cheese is made up. If the cloths are drawn over the cheese too tightly unnecessary strain is placed on the cloths at the edge of the cheese, which will cause them to burst. Care in laying-up the cheese will make it press straight, will prevent injury to the cloths and racks, will make them last longer, and will give a larger yield of juice.

Whichever type of press is used, the pressure should be applied gradually and slowly, in order to allow the juice, which cannot be compressed, to escape. Pressure applied too suddenly will have the effect of hardening the outer layers of the pomace and retaining the juice.

Using a mill of the grater type in combination with a good hydraulic press, a ton of fruit should render about 165 gallons of juice, or a little over 3 gallons to the bushel.

(To be continued.)

FABRAEA-SCALD, FABRAEA MACULATA (LEV.) ATK.*

A FUNGOUS DISEASE OF THE PEAR AND QUINCE.

G. H. CUNNINGHAM, Biological Laboratory, Wellington.

THIS disease is widely spread throughout the world, for it has been recorded from Europe, North America, and Australia. In New Zealand it has been found only on the pear and quince, but in North America it has been recorded in addition on the hawthorn and apple.

ECONOMIC IMPORTANCE.

Fabraea-scald attacks leaves, shoots, and fruits. On leaves it forms spots which, if numerous, may so damage the leaf as to cause it to fall prematurely. Where infection is severe partial defoliation follows, with the result that the crop is reduced the following season. On shoots its effects are generally slight, but in cases of severe infection the laterals may be killed outright, especially at the tips. The chief source of loss is through the fruit, for on them the disease forms large discoloured spots and frequently crevices, which disfigure and render the fruit unsaleable. Through the crevices the spores of secondary fungi enter and cause rapid decay.

Nursery stock is frequently attacked and partially or totally defoliated, consequently infected trees make little or no growth, and are thus rendered unsaleable.

*Synonyms: *Entosporium maculatum* Lev.; black-spot; fruit-spot; leaf-blight; leaf-scald; leaf-spot; quince fruit-spot; scald.

APPEARANCE ON THE HOSTS.

In New Zealand fabraea-scald is common wherever the quince is grown, appearing on the leaf, shoot, and fruit; on pear the trouble is much less common, for although it is not uncommon on the fruit it has seldom been found on the leaf.

On leaves, shortly after they unfold from the bud, the disease appears first in the form of minute, purplish, slightly raised spots on the upper surface (Fig. 1, *b*). In the centre of each spot a small white dot becomes visible—the opening through which the conidia escape. The spots gradually increase in diameter, at the same time changing in colour, and appear on the under-surface of the leaf. They may enlarge until they are about $\frac{1}{4}$ in. in diameter, when they appear at



FIG. 1. QUINCE-LEAVES INFECTED WITH FABRAEA-SCALD. NATURAL SIZE.

(*a*) Showing both late and early infection; (*b*) showing early infection.

[Photo by G. H. Cunningham.]

first dark brown, later changing to ashy grey (Fig. 1, *a*), or they may become much larger and more irregular in shape, and reddish-brown in colour. Finally these irregular spots may coalesce and form large irregular areas, which may eventually cover the greater part of the leaf.

In or near the centre of the spots are minute black specks, the fructifications of the fungus. On the leaf-stalks (petioles) small cankers are sometimes formed; when these occur the leaf is killed outright and falls away.

On laterals small, elliptical, somewhat sunken spots are produced. The spots are dark brown, with a slightly lighter-coloured raised margin. These spots may remain small and inconspicuous, and are thus readily overlooked, or they may enlarge until the shoot becomes girdled and dies, becoming then noticeable. Owing to the small size of most of these spots on the shoots, shoot-infection has frequently been overlooked; but this condition plays an important part in the perpetuation of the disease. The significance of this will be discussed later in this article.

On fruits the disease forms spots which differ slightly on different hosts.

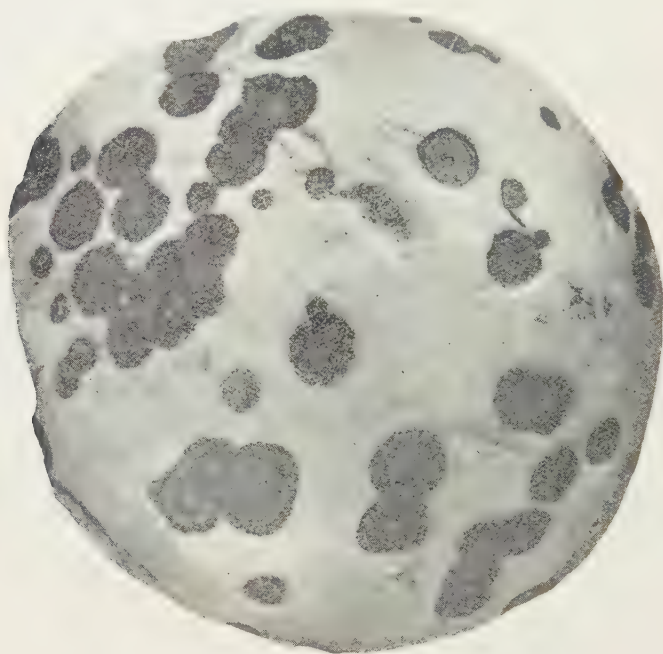


FIG. 2. QUINCE-FRUIT SHOWING SPOTS CAUSED BY *FABRAEA-SCALD*. NATURAL SIZE.

Note that the spots are sunken, black, and frequently zoned.

[Photo by G. H. Cunningham.]

On pear-fruits the spots are at first small, circular, and a rich carmine. They gradually become black in the centre, and become surrounded by a light reddish-brown zone. At this stage spots superficially resemble those caused by black-spot (*Venturia Pirina*) and are frequently mistaken for them. Finally the surface of the spot becomes roughened and broken, due to the epidermis being raised in the form of a small blister, which is ruptured by the developing fructifications. Frequently the disease forms large irregular cracks on the surface of the fruit; this occurs especially when developing fruits become infected, for the cambium being damaged further growth in the region of the spot is prevented.

On quince-fruits dark-brown or black spots are formed. As these increase in size they become somewhat sunken and darker in colour, and often become zoned. They may attain to a size of $\frac{1}{2}$ in. or more in diameter. These spots may remain isolated, or coalesce to form large irregular areas. In the latter case the fruit usually becomes misshapen and often falls prematurely. Cracking sometimes occurs as in the pear.

Thus on pear the spots are usually small, brightly coloured, and much roughened, while on quince they are dull brown or black, sunken and usually much larger in size.

LIFE-HISTORY OF THE CAUSATIVE ORGANISM.

The disease is caused by *Fabraea maculata* (Lev.) Atk., a fungus possessing two spore-stages in its life-cycle. The first or conidial stage (formerly known as *Entomosporium maculatum* Lev.) is parasitic, occurring on living leaves, shoots, and fruits, forming thereon the discoloured spots described above. The second or ascigerous stage (*Fabraea maculata*) is saprophytic, appearing only on dead leaves which have lain on the ground for some months.

The disease first appears in the spring, shortly after the leaves unfold from the bud. Infection of these leaves would appear to occur either from ascospores produced from fallen leaves in which the fungus has overwintered, or from conidia produced from mycelium which has overwintered in small cankers (spots) on the shoots.

The spores (ascospores or conidia) are carried to the developing leaves by wind or other agency, where, should conditions prove favourable, they germinate and produce a hypha which penetrates the epidermis and enters the tissues, where it forms a mycelium the hyphæ of which derive their food substances from the host-cells. The hyphæ spread outwards and downwards, killing the cells with which they come in contact, the dead cells forming the discoloured spots characteristic of the disease.

After a time the hyphæ form beneath the epidermis a small flattened receptacle (pycnidium) in which the spores are developed. The pycnidium as it develops pushes up the epidermis as a small blister, finally rupturing it and becoming exposed. The pycnidium does not possess an opening (ostium) through which the spores emerge, but ruptures irregularly, the ruptured margins standing above the surface of the leaf or fruit, thus giving to the spot the roughened appearance described above. The conidia are so characteristic that their presence is a certain indication that the spots are due to this fungus. Each conidium is four-celled, the cells being arranged in the form of a cross (cruciate). From the free surface of each is produced a fine flagellum (Fig. 3, *f*). The conidia are hyaline and are borne on short stalks (conidiophores) which arise from the base of the pycnidia.

From the first-formed spots spores are produced which infect developing leaves and fruits; conidial infection continues in this manner throughout the growing season. In the autumn infected leaves fall to the ground, and the mycelium within the spots remains dormant until the late winter or early spring, when it produces a second fructification. This appears on the free surface of the leaf as a pale-



FIG. 3. CRUCIATE CONIDIA OF FABRAEA MACULATA. $\times 1000$.

(*fl*) Flagellum ; (*con*) conidiophore.

[Original.]

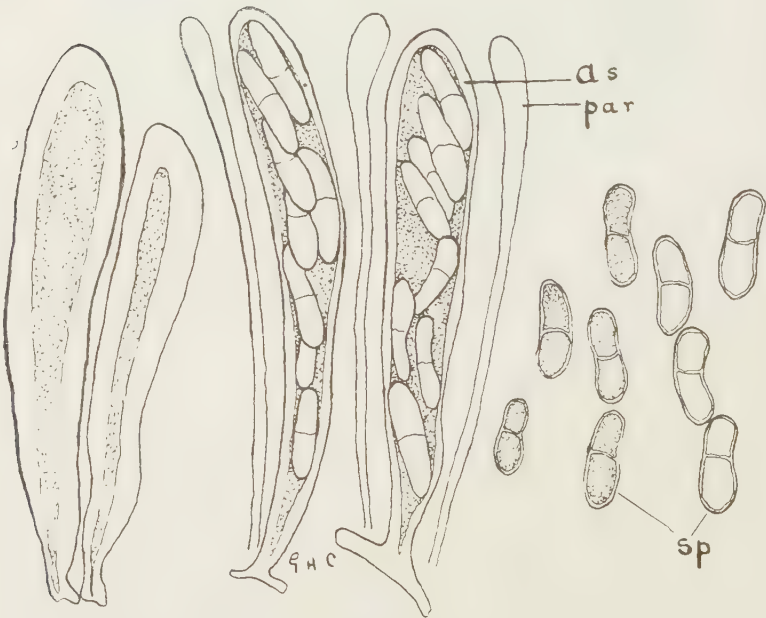


FIG. 4. ASCI, PARAPHYSES, AND ASCOSPORES. $\times 1000$.

(*As*) Ascus ; (*par*) paraphysis ; (*sp*) ascospores.

[Original.]

yellow, cup-shaped apothecium so minute as to be barely visible to the eye, being in fact only about $\frac{1}{50}$ in. in diameter. The inner surface of this structure is lined with a closely-packed layer of asci and paraphyses. Each ascus contains eight hyaline two-celled ascospores (Fig. 4).

The connection between the conidial and ascigerous stages has been experimentally proved by Atkinson (1909). He sowed ascospores on culture media and obtained conidia; with the conidia thus produced he inoculated leaves and produced the spots characteristic of this disease.

On account of Atkinson's work it is frequently stated in the literature dealing with this disease that the method of overwintering of the causal organism is by means of resting mycelium in the fallen leaves, this mycelium in the spring producing apothecia and ascospores, the latter infecting leaves as they emerge from the buds. But it would appear that the ascigerous stage is by no means as common as we are led to believe, for during the past spring I have made a continuous search for the ascigerous stage of *fabraea*-scald, but without success. I had leaves, gathered from beneath quince-trees severely infected the previous season, despatched to the laboratory for examination. The first collections were made about three weeks prior to blossoming, and collections continued to arrive at intervals of one week until about the middle of November.* In all, several thousands of leaves were forwarded in all stages of preservation, but in no single instance were either conidia or ascospores obtained from them. Further, all attempts to induce sporulation under artificial conditions failed. While this evidence is not conclusive, it shows that this season at least at Ruakura no ascospores or conidia were produced on fallen leaves, yet the current season's leaves there are all severely infected.

Furthermore, on failing to obtain apothecia in New Zealand, I wrote to several authorities in North America for specimens. In reply they stated that no material was available. Professor H. M. Fitzpatrick, New York State College of Agriculture, Cornell University, stated that apparently this stage has not been collected and recorded since the type material was collected and described by Atkinson (1909). Professor Fitzpatrick kindly loaned me part of the type material, from which the accompanying illustrations of asci and ascospores have been drawn.

Thus we are led to seek another means whereby the fungus is able to overwinter. It is improbable that the conidia are able to live through the winter months on the fallen leaves, for none were present on the many leaves examined.

Several authorities claim that the mycelium in infected twigs is perennial, and that this mycelium in the early spring produces conidia which infect the developing leaves. Although conclusive evidence of this is wanting it is probable that such is the case, for it is obvious that some such additional source of infection is necessary in order to account for the heavy infection that occurs at blossoming-time, and we have already seen that the ascigerous stage is apparently rare.

* The writer is indebted to Mr. T. Roach, Horticultural Overseer, Ruakura Farm of Instruction, for the collection and forwarding of this material.

CONSIDERATIONS REGARDING CONTROL.

From a consideration of the foregoing it would appear that there are two probable methods whereby this organism may overwinter—(1) by resting mycelium overwintering in the fallen leaves (producing apothecia and ascospores in the spring), and (2) by resting mycelium in the shoots (producing conidia in the spring).

Thus control measures would consist firstly in the removal of these sources of infection, and secondly in the prevention of infection by coating developing leaves and fruits with some suitable fungicide. It would be difficult to detect the cankers on laterals, so that the removal of such infected shoots is not stressed; but in order to minimize this source of infection it is suggested that quince-trees be regularly pruned, all weakly growth removed, and the trees opened out in such a manner as to facilitate spraying—for too often these trees are neglected. And it must be borne in mind that the fungus may spread from quince to pear, consequently it is essential that the quince-trees be not overlooked during pruning and spraying operations.

To minimize infection from fallen leaves it is suggested that the orchard be ploughed in the late autumn after all the leaves have fallen, and that all portions beneath the trees not reached by the plough be turned over with a spade.

CONTROL.

As in essentials the life-history of fabraea-scald is very similar to that of apple and pear black-spot, it follows that remedial treatment would be of a similar nature. Thus, in addition to pruning and ploughing, the following spray schedule is recommended:—

No.	Time of Application.	Spray.
1	Green-tip	5-4-50 bordeaux, or 1-10 lime-sulphur.
2	Between open-cluster and pink stage	3-4-50 bordeaux, or 1-10 lime-sulphur.
3	Calyx-spray (petal-fall or when majority of petals have fallen)	1-100 to 1-120 lime-sulphur.
4	Ten days later	1-100 to 1-120 lime-sulphur.
5	Every month until the fruit reaches maturity	1-100 to 1-120 lime-sulphur.

As this is the schedule recommended for pear black-spot control it follows that where the latter disease is prevalent in a district no further spray treatment will be required in order to combat fabraea-scald on the pear host.

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LUCERNE AS A PROTECTION AGAINST FIRE.

THE value of lucerne for fire-break purposes was strikingly demonstrated last month at Ben Morven, Marlborough, in which district a prolonged spell of dry weather had been experienced. The Ben Morven seed-farm, which is devoted mainly to the production of lucerne-seed, is situated on an extensive stretch of cropping-land, at the foot of hills covered with danthonia. At the time in question the danthonia grassland was exceedingly dry, while in the vicinity of the farm were hundreds of stacks of early oats grown for chaff.

Under these conditions a fire which broke out on 9th January in the farm apiary, with a north-west wind blowing, threatened to sweep miles



OUTBREAK OF FIRE AT BEN MORVEN SEED-FARM.

The lucerne-field which checked the fire is situated behind the willow-trees, the danthonia-covered hills being in the background.

of grassland and destroy much valuable harvested crop. The wind carried the flames straight towards the danthonia hills, but, thanks to a lucerne-field which intervened, it was possible to keep the fire under control, and little actual damage resulted.

In the drier districts, where grass-fires are liable to occur, the establishment of protection belts of lucerne at suitable points is well worth the consideration of farmers. They may be regarded as a form of fire insurance, apart from their value for forage and grazing purposes. Proper management as regards cutting, &c., would, of course, be necessary.

—F. W. Greenwood, *Instructor in Agriculture, Blenheim.*

Royal Agricultural Society.—An Order in Council gazetted on 12th January formally incorporated the Royal Agricultural Society of New Zealand.

TESTING OF PUREBRED DAIRY COWS.

REVIEW OF THE NEW ZEALAND C.O.R. SYSTEM IN 1923.

W. M. SINGLETON, Director of the Dairy Division.

DURING the calendar year under review climatic conditions in the Dominion have been somewhat abnormal from the dairying point of view, an almost perfect dairying autumn and a mild winter generally being followed by an exceptionally dry period in late spring and early summer. The performances of purebred cows under certificate-of-record test have naturally been more or less affected according to the date at which they completed their lactation period, those finishing early in the spring having a distinct advantage over the later calvers. Nevertheless, the yield of the average cow under test has been well maintained, and so far as individual records are concerned it has been an exceptional year. Two cows, a Jersey and a Friesian, have received certificates on productions exceeding 1,000 lb. of butterfat, and of the twenty-three classes into which the breeds participating in the C.O.R. testing are as a whole subdivided no less than twelve of the previous class-leadership yields have been exceeded.

CERTIFICATES ISSUED.

The total number of cows which have received first-class certificates since the commencement of the C.O.R. system now stands at 3,389. The highest number of certificates issued during 1923 went to the Jerseys, that breed being represented by 569 cows, of which 518 were on first performance. In total certificates this represents an increase of 172 certificates over the number issued to the breed for the previous year. The Friesians, with 162, show a slight decrease, while the other breeds represented stand about the same as for 1922. The following table gives particulars of certificates issued since the commencement of the system:—

Breed.	1913.		1914.		1915.		1916.		1917.		1918.		1919.		1920.		1921.		1922.		1923.	
	Ordinary.	Repeat.	Ordinary.	Repeat.	Ordinary.	Repeat.	Ordinary.	Repeat.	Ordinary.	Repeat.	Ordinary.	Repeat.	Ordinary.	Repeat.	Ordinary.	Repeat.	Ordinary.	Repeat.	Ordinary.	Repeat.	Ordinary.	Repeat.
Jersey ..	67	104	14	91	4	94	11	94	13	113	8	150	14	227	33	339	49	351	46	518	51	
Friesian ..	48	67	11	62	9	44	5	62	14	57	14	54	7	82	23	128	25	136	32	130	32	
Milking Shorthorn..	..	..	..	2	..	7	..	21	..	22	..	53	3	59	2	31	6	25	2	24	6	
Ayrshire ..	2	15	1	12	1	9	..	4	4	4	..	..	..	5	..	10	1	18	5	17	3	
Red Poll ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	12	7	8	3	3	1	
Shorthorn	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	..	1	0	
Totals	117	186	26	167	14	154	16	181	31	196	22	259	24	373	58	519	88	543	88	693	93	

FRIESIANS.

Class-leaders.

In the Friesian class-leaders only one change has been made from last year's list—Bainfield 27th (see *Journal* for November last) going to the head of the senior four-year-olds in place of Buttercup

3rd of Ashlynn. When it is kept in mind, however, that the records for this breed range from 740·50 lb. butter-fat in the junior two-year-old class to 1,145·24 lb. fat for the mature class-leader, it must be recognized that further changes in the list will be slower in coming than in the past. The table for 1923 is as follows:—

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days	Milk.	Fat
<i>Junior Two-year-old.</i> Monavale Queen Bess	T. H. Richards, Cardiff	Yrs. dys 2 16	lb. 242·1	365	lb. 20,501·1	lb. 740·50
<i>Senior Two-year-old.</i> Netherland Princess 4tl	John Donald, Westmere	2 34	274·6	365	19,621·6	805·77
<i>Junior Three-year-old.</i> Monavale Queen Bess	T. H. Richards, Cardiff	3 56	282·6	365	21,609·3	800·18
<i>Senior Three-year-old.</i> Manor Beets Daughter 2nd of Ashlynn	C. A. Hopping, Palmers- ton North	3 29	306·6	365	18,733·9	863·51
<i>Junior Four-year-old.</i> Westmere Princess Pietertje	John Donald, Westmere	4 15	329·1	365	24,199·0	939·78
<i>Senior Four-year-old.</i> Bainfield 27th ..	C. H. Potter, Pukerau	4 35	348·6	365	23,203·3	910·74
<i>Mature.</i> Alcartra Clothilde Pietje	Vernon Marx, Manga- toki	7 35	350·0	365	31,312·5	1,145·24



BAINFIELD 27TH (C. H. POTTER, PUKERAU).
Leader of the Friesian senior four-year-old class.

Friesian Class-averages.

Six out of the seven classes into which the Friesian breed is divided show increases over the respective class-averages for the previous year. The only class showing a decrease is the junior three-year-old, but it is to be remembered that so small a class—only fifteen cows—is strongly affected in the average by individual records. The 1922 junior three-year-old class contained some outstanding individuals, while 1923 has been less marked in that respect. During the year eight Friesians yielded over 800 lb. of butterfat, of which one exceeded 900 lb. and one 1,000 lb.

The total number of Friesians which gained certificates in 1923 was 162, while in the previous year the number was 168. To the end of 1923 the total number of certificates issued to Friesians was 1,042, and the average yield 463·88 lb. butterfat from 13,116·3 lb. milk in 343 days. For 1923 the 162 certificates issued were on an average yield of 14,752·3 lb. milk, containing 515·62 lb. butterfat, in an average milking-period of 350 days, an increase of 9·53 lb. butterfat over the previous year.

The class averages for 1923 and 1922 are given in the following table:—

Class		Number of Cows.	Average Yield for Season.		
			Days in Milk.	Milk.	Fat.
			1923.	lb.	lb.
Junior two-year-old	..	50	345	11,435'4	406'27
Senior two-year-old	..	16	348	14,343'4	497'45
Junior three-year-old	..	15	347	12,572'7	445'21
Senior three-year-old	..	11	355	16,253'1	583'27
Junior four-year-old	..	12	353	15,885'1	551'06
Senior four-year-old	..	17	357	17,516'6	604'07
Mature	..	41	353	17,878'2	616'19
			1922.		
Junior two-year-old	..	67	343	11,421'1	404'32
Senior two-year-old	..	15	352	12,382'3	419'29
Junior three-year-old	..	14	358	15,779'2	528'94
Senior three-year-old	..	17	345	14,228'2	480'59
Junior four-year-old	..	9	346	14,361'6	508'51
Senior four-year-old	..	8	346	16,423'1	571'56
Mature	..	38	341	15,615'3	541'40

Friesian C.O.R. Bulls.

A bull is classed as a C.O.R. bull when he has sired four or more certificated daughters, each from a different dam. The Friesian C.O.R. bulls now total sixty-seven, fourteen new names having been added during the year under review. These sixty-seven bulls have a total of 490 C.O.R. daughters to their credit, which represents over

50 per cent. of the total certificates issued to the cows of the breed. Cliffside Laddie and King Segis Wild Rose Homestead have each added a daughter during the year, and remain at the head of the list with a strong tally of twenty C.O.R. daughters each. Following is a list of the bulls:—

Name of Bull.	Total of C.O.R. Daughters.	Number of Daughters qualified during 1923.	Name of Bull.	Total of C.O.R. Daughters.	Number of Daughters qualified during 1923.
Cliffside Laddie ..	20	0	Black and White King of Ashlynn*	5	4
King Segis Wild Rose Homestead	20	1	Colantha Pontiac ..	5	1
Woodcrest Joe ..	18	0	Colantha Johanna Lad	5	0
King Fayne Segis 2nd	16	1	Colantha Pietertje	5	0
Sir de Kol Inka Pie- tertje	16	0	Count de Kol		
Prince Pietje Paxton	14	2	Dominion de Kol Do- mino	5	0
Woodcrest Hengerveld	14†	1	Dominion Dutchland	5	0
Mechthilde			Friesland Dirk* ..	5	2
De Kol Pontiac Burke	13	1	King of the Black and Whites	5	1
Kruger 2nd ..	13	0	King Alcartra Rose de Kol	5	1
Paul Pietertje ..	13	0	Longbeach Big Patch	5	1
Bainfield Dutchman	11‡	3	Medbury Prince ..	5‡	1
Longbeach Van Tromp	11	0	Marquis Segis Colan- tha*	5‡	3‡
Grace's Netherland of Riverside	10	0	Rex de Kol of Sunny- croft	5	0
Mutual Piebe of Rock	10	0	Salma Torohunga No. 1	5	0
Nazli de Kol ..	10	0	Woodcrest Johanna Pontiac ..	5	0
King of Dominos ..	9	3	Canterbury King of Kingsbrook*	4	1
Mutual Piebe de Kol	9	0	Colantha Johanna ..	4	0
Netherland King of Rosevale	9	1	Cordylne Hero* ..	4	2
Longbeach Primrose League	8	0	Dominion Domino Dutch Boy	4	0
Mutual Mercedes Pie- tertje	8	2	Friesland Gem* ..	4	4
Rosevale Korndyke	8	2	Friesland Colantha Lad	4	0
Sylvia Posch			Friesland Park von Bulow*	4	1
Royal King Champion	8	3	Holland Queen's Son	4	0
Sir Colantha Korndyke	8	0	Indi Paul of Lakeside	4	0
Rag Apple			King Laddie* ..	4	1
Woodcrest Pietje Pon- tiac	8	1	King Segis of Friesland Park	4	0
Edinglassie ..	7	0	Longbeach Dutchman	4	0
Dominion Oak de Kol 2nd Homestead	7	0	Longbeach Major ..	4	0
Fobes			Marquis Piebe de Kol*	4	4
Rosevale King Sylvia*	7*	4*	Netherland King ..	4	0
Bainfield Prince ..	6	0	Oakwood Holland King	4	0
Colonel Manor of River- side	6	0	Pietertje Boy ..	4	0
Cordylne Colantha Hero*	6	4	Paroora Bindal ..	4	0
Dominion Woodcrest Piebe Mercedes*	6	4	Rozine's Butterboy ..	4	0
Felix de Kol of Mona- vale*	6	4	Soldene Grace* ..	4	2

* First entry of bull on list. ‡ Also one second-class certificate daughter.

JERSEYS.

Class-leaders.

During the year four out of the five classes into which the Jersey breed is subdivided have had the previous highest yield for the class exceeded. The only previous record which remains is that of Mr. A. J. Smith's St. Lambert's Bell, leader of the four-year-olds, while the outstanding new performance is that of Pretty's Flirt, whose yield of 1,010·49 lb. of butterfat in the mature class (constituting her champion Jersey cow of New Zealand) will be difficult to displace. Pedigree notes and general comment on all four new leaders were published in the *Journal* for November and December last. The class-leaders as they stand at the close of 1923, are as follows:—

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Fat.
<i>Junior Two-year-old.</i> Alfalfa Pansy ..	F. J. Saxby, Hamilton	Yrs. dys. 2 4	lb. 240·9	365	lb. 10,898·1	lb. 690·16
<i>Senior Two-year-old.</i> Marshland's Stylish Princess	W. J. Chynoweth, Hamilton	2 353	275·8	365	9,927·7	715·75
<i>Three-year-old.</i> Zola of Rosy Creek ..	E. Joyce, Kaponga ..	3 43	281·3	365	12,478·6	741·20
<i>Four-year-old.</i> St. Lambert's Bell ..	A. J. Smith, Cardiff ..	4 283	341·8	365	14,423·1	780·32
<i>Mature.</i> Pretty's Flirt ..	W. H. Miers, Rukuhia	6 353	350·0	365	16,684·1	1010·49



PRETTY'S FLIRT (W. H. MIERS, RUKUHIA, HAMILTON).

Leader of the Jersey mature class and champion cow of the breed in New Zealand.

Jersey Class-averages.

The Jersey classes for 1923 include the records of 569 cows, as against 397 for the previous year. With the exception of the four-year-old all classes are considerably stronger numerically, the largest increases, as might be expected, falling to the junior two-year-olds and the mature cows. The junior two-year-olds have increased by sixty-two, and, despite the large percentage of cows whose records fall into this class, the average of all certificates issued to the breed since the commencement of the system has increased (for the year) by 8.31 lb. butterfat, bringing the present average yield to 428.52 lb. butterfat, in an average milking-period of 343 days for 2,391 certificates issued.

For 1923 the average C.O.R. Jersey yielded 455.13 lb. butterfat, from 8,177.4 lb. milk, in 348 days; the corresponding averages for 1922 were 443.75 lb. butterfat, from 8,007.5 lb. milk, in 344 days. Individually as well as collectively the class-averages have increased. Regarding the junior two-year-old class, it may be stated that the average age at commencement of test was 1 year 353 days. Thus, working on the usual basis of 240.5 lb. butterfat as minimum standard, the average of 238 heifers in this class was 157.32 lb. butterfat above the requirement for certificate.

The figures for 1923, together with those for 1922, are as follows:—

Class.	Number of Cows.	Average Yield for Season.		
		Days in Milk.	Milk.	Fat.
1923.				
Junior two-year-old ..	238	348	7,122.7	397.82
Senior two-year-old ..	63	344	7,991.2	457.13
Three-year-old ..	99	350	8,636.8	482.08
Four-year-old ..	45	345	9,044.9	499.06
Mature ..	124	350	9,614.4	526.63
1922.				
Junior two-year-old ..	176	342	6,950.4	390.17
Senior two-year-old ..	41	350	7,815.2	427.75
Three-year-old ..	57	337	8,342.8	462.10
Four-year-old ..	37	348	8,869.7	498.37
Mature ..	86	349	9,669.5	525.38

Jersey C.O.R. Bulls.

The list of Jersey bulls which have qualified for the C.O.R. class now includes 140 names, representing 1,113 cows, or more than 50 per cent. of the cows of the breed which have gained certificates. On account of the large number of names involved it is impossible to make individual comment. The Jersey Cattle Breeders' Association, however, has what they name a champion butterfat bull class, and four of the bulls in the appended list are entitled to inclusion in this class. In order to qualify a bull must have five certificated daughters from different dams, each daughter at least doubling her butterfat requirement for certificate. The four bulls referred to are Bilberry's Twylsh, with seven such C.O.R. daughters; Belvedere Sun Prince, six daughters; Grannie's Knight, seven daughters; and Sunflower's Perseus, five

daughters. The conditions are severe, and those bulls successful in qualifying for this class may be considered as outstanding animals which have demonstrated their power of prepotency, one of the most desirable qualities of a dairy sire.

Following is the complete list of Jersey C.O.R. bulls:—

Name of Bull.	Total of C.O.R. Daughters.	Number of Daughters qualified during 1923	Name of Bull.	Total of C.O.R. Daughters.	Number of Daughters qualified during 1923
Eminent's Fontaine ..	33	5	Oculist 12th ..	8	0
Grannie's Knight ..	31†	17†	Peggy's Campanile ..	8†	0
Majesty's Fox ..	30	0	Rainbow's King ..	8	3
K.C.B. ..	28	2	Admiral ..	7	2
Sultan's Disdain ..	26†	12†	Beachland's Com- mander*	7	6
Noble Twylish ..	20	5	Brighton Twylish ..	7	0
Fancy's Lord Twylish	21	2	Blizzard ..	7	0
Roberts ..	19	0	Charm's Lord ..	7†	2
Admiral of Puketapu	19	2	Eileen's Fox* ..	7	3
Belvedere Sun Prince	18†	5†	Goddington ..	7	0
Proud Fox* ..	15†	13†	Genoa Nelson Chase	7	2
Golden Swan ..	13	2	Masterpiece of Meadow brook	7	1
Holly Bank Squire ..	13	8	Maid's General ..	7†	1
Mona's Ally ..	13	7	Marcus ..	7	1
Bilberry's Goddington	12	0	Silverlock's Duke ..	7	2
Neathead's Majesty*	12†	9†	Stevenson ..	7	0
Sunflower's Perseus ..	12	0	Twylish Hope ..	7	2
The General ..	12†	1†	Belvedere Sunset ..	6	0
V.C. ..	12	5	Beachland's White Swan*	6	5
Exile of Oaklands ..	11†	4	Belvedere Butter Boy	6	0
Good Luck ..	11	1	Flower Boy 2nd ..	6	2
Renown of Meadow- brook	11	2	Grannie's Campanile Sultan*	6	3
Sweet Fox of Colling- wood	11	5	Golden Fox 2nd ..	6	0
Te Rapa Lad* ..	11	8	Grand Duke ..	6	0
Bilberry's Twylish ..	10†	4	Maori Captain* ..	6	5
Campanile's Sultan ..	10	0	Meadowbrook Nobility	6	0
Farleigh Fox ..	10†	1	Mabel's Dairyman ..	6	0
Lady's Duke ..	10†	1	Mountain View's Rioter*	6	3
Molina's General ..	10	2	Oakvale's Red Line ..	6†	1
Rainbow ..	10†	0	Pride of Egmont ..	6	0
Soumise Tom ..	10	2	Sherry's Fox of Col- lingwood*	6	4
Viola's Golden Laddie	10	4	Sunglow* ..	6	2
Belvedere Bilberry's Last	9	3	Belvedere Star* ..	5	2
Bush Boy ..	9†	1†	Blondin ..	5	0
Charm's Lord Twylish	9	0	Eileen's Fox 2nd* ..	5	5
Lord Twylish ..	9	1	Flandrine's Swan ..	5	1
Mermaid Sultan ..	9	1	Gavotte's Hero ..	5†	†
M.L.C. ..	9	0	Hawkesbury Black Prince	5	0
Petune's Noble ..	9†	2†	Ivondale's Rainbow*	5	4
Rozel's Sultan ..	9	0	Juno's Laddie ..	5	0
Soumise Majesty ..	9	0	King Twylish* ..	5	2
Sunlight's Noble Gene- ral	9	2	Lord Nelson ..	5†	0
Starbright ..	9	0	Lord Lepperton ..	5	0
The Owl's Victor ..	9†	1	Lord Gamboge* ..	5†	2
Belvedere Jersey Boy	8	3	Mona's Campanile ..	5	0
Friskay Campanile ..	8	0	M.H.R. ..	5	0
Hawksbury Emperor	8	1			
Heather Boy ..	8	0			
Miro Meadow Star ..	8	4			

JERSEY C.O.R. BULLS—*continued.*

Name of Bull.	Total of C.O.R. Daughters.	Number of Daughters qualified during 1923.	Name of Bull.	Total of C.O.R. Daughters.	Number of Daughters qualified during 1923.
Miro Meadows Maori Boy	5	0	Fancy Carnation's Fox	4	0
Protection of Meadow- brook	5	0	General Noble* ..	4	1
Rose's Attraction's Fox*	5	5	Golden Swan's Lad* ..	4	4
Silver Conqueror ..	5	1	Glory ..	4	0
Senior ..	5	1	Knight Commander ..	4	0
Shamrock of Beach- lands*	5	3	Lord Maitland ..	4	0
Silver King (Stuckey's)	5	0	Mayflower Magnet 2nd	4	0
Signor* ..	5	3	Maid's Noble General	4	0
The Squire (1272) ..	5	0	Melia Ann's Sultan ..	4 [†]	0
Briar's Twylish* ..	4	2	Meadowvale Conqueror [†]	4	3
Butterman Lad ..	4	0	Mere's Conqueror* ..	4	2
Black Swan ..	4	0	Miro Meadow's Dick*	4	4
Belle's Arclight Knight*	4	1	Miro Meadow's Paddy*	4	2
Belvedere Sun King*	4	1	Napper* ..	4	2
Bonnie Mac* ..	4	4	Nestor of Willowbank	4	0
Brentwood Gallant*	4	1	Noble Sultan* ..	4	2
Chief of Jersey Mea- dows*	4	3	Noble Warder ..	4	0
Defender of Meadow- vale	4	0	Prince Enid* ..	4	1
Floss's Starlight* ..	4	1	Rarity of Meadow- brook*	4	1
Fairy's Campanile ..	4	0	Shamrock's Sweet Lad*	4	4
			Starlight 2nd ..	4	0
			Una's Nobility ..	4	0
			Vulpes of Bulls* ..	4	1
			Yankee Sweet ..	4	0
			Young Emperor 3rd	4	0

* First entry of bull on list. † Also two second-class-certificate daughters.

‡ Also one second-class-certificate daughter.



MARSHLANDS STYLISH PRINCESS (W. J. CHYNOWETH, HAMILTON).

Leader of the Jersey senior two-year-old class.

MILKING SHORTHORNS.

Class-leaders.

The year 1923 has brought four changes to the leaderships of the seven classes of the Milking Shorthorn breed. As with the new leaders of other breeds, notes have appeared in the *Journal* regarding the performances of these four record-breakers. Although the highest class-leaders for this breed fall considerably short of the best performances of the Jerseys and Friesians, their records are nevertheless very creditable, and it is pleasing to note an upward tendency from year to year. The list is as follows:—

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Fat.
<i>Junior Two-year-old.</i> Matangi Quality 4th	Ranstead Bros., Matangi	Yrs. dys. 2 109	lb. 251·4	365	lb. 14,572·8	lb. 591·89
<i>Senior Two-year-old.</i> Birkland Dainty ..	G. N. Bell, Palmerston North	2 281	268·6	365	11,616·9	459·98
<i>Junior Three-year-old.</i> Dominion Carnation of Ruakura	Ruakura Farm of Instruction, Hamilton East	3 9	277·9	348	9,942·6	439·20
<i>Senior Three-year-old.</i> Matangi Ruth 2nd ..	Ranstead Bros., Matangi	3 304	307·4	365	14,032·7	747·86
<i>Junior Four-year-old.</i> Matangi Nancy 2nd ..	Ranstead Bros., Matangi	4 3	313·8	365	15,591·6	608·28
<i>Senior Four-year-old.</i> Sweet Garnett 2nd of Cornwall Park	R. S. Allan, Hatuma..	4 359	349·4	365	16,260·3	514·19
<i>Mature.</i> Maniaroa Princess ..	Ranstead Bros., Matangi	..	350·0	365	15,951·7	700·76

Milking Shorthorn Class-averages.

Of the seven classes into which the Milking Shorthorn breed is divided only two—the junior two-year-old and the mature—offer any opportunity for comparison with the previous year's results. Of the remaining classes the junior three-year-old and the junior four-year-old have only two representatives, and each of the others only one. The junior two-year-old class comprises six records, and these average 459·69 lb. butterfat, an increase of approximately 145 lb. over six records in the same class for the previous year. In the mature class eight cows in 1922 averaged 444·28 lb. butterfat, and in 1923 sixteen cows in the same class are credited with an average yield of 474·65 lb. Thus each class shows a considerable increase in average production. The thirty Milking Shorthorns which gained certificates during the year

had an average yield of 11,737.1 lb. milk, containing 463.25 lb. butter-fat, in an average milking period of 343 days.

The class-averages for this breed for 1923 and 1922 are as follows:—

Class.	Number of Cows.	Average Yield for Season.		
		Days in Milk.	Milk.	Fat.
	1923.		lb.	lb.
Junior two-year-old ..	6	352	12,145.8	459.69
Senior two-year-old ..	2	336	8,750.3	337.39
Junior three-year-old ..	2	301	7,945.4	309.97
Senior three-year-old ..	1	365	14,032.7	747.86
Junior four-year-old ..	2	365	12,892.0	494.14
Senior four-year-old ..	1	365	16,260.3	514.19
Mature	16	340	11,860.7	474.65
	1922.			
Junior two-year-old ..	6	358	7,681.4	314.27
Senior two-year-old ..	4	331	8,085.0	312.84
Junior three-year-old ..	4	326	9,238.0	378.51
Senior three-year-old ..	2	333	9,257.2	358.26
Junior four-year-old ..	2	340	9,569.2	368.14
Senior four-year-old ..	1	365	10,963.1	418.04
Mature	8	340	11,200.3	444.28



MATANGI RUTH 2ND (RANSTEAD BROS., MATANGI).

Leader of the milking Shorthorn senior three-year-old class, and champion cow of the breed in New Zealand.

Milking Shorthorn C.O.R. Bulls.

The Milking Shorthorn bulls which have qualified for the C.O.R. class now number three. The outstanding bull is Dominion Esau of Ruakura, bred by the Department of Agriculture at the Ruakura Farm of Instruction, Hamilton. He now has six daughters to his credit, including Matangi Quality 4th, with 591·89 lb. butterfat as a junior two-year-old; Matangi Nancy 2nd, with 608·28 lb. as a junior four-year-old; and Matangi Ruth 2nd, the New Zealand champion of the breed, with 747·86 lb., as a senior three-year-old. All three of these high producers are owned by Messrs. Ranstead Bros., of Matangi. Each of the other two bulls of the breed to qualify—Orakau Legislator and Dilworth Baronett—has four C.O.R. daughters.

AYRSHIRES.

Class-leaders.

The list of Ayrshire class-leaders shows three changes from last year, Mr. W. Hall's two-year-old, Dimple of Edendale, going to the head of her class, and Ivanhoe Fancy and Ivanhoe Fillpail taking the lead of the four-year-old and mature classes respectively. Some comment on Dimple of Edendale appeared in the December *Journal*, while the other two animals just mentioned make their first appearance in the *Journal* in the appended closing list for 1923. Some brief pedigree notes concerning them are also given in connection with the list. The table of class-leaders is as follows:—

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cent.	Yield for Season.		
				Days.	Milk.	Fat.
<i>Two-year-old.</i>		Yrs. dys.	lb.		lb.	lb.
Dimple of Edendale	W. Hall, Lepperton ..	2 327	273·2	365	13,063·3	529·46
<i>Three-year-old.</i>						
Greenfield's Ina ..	C. E. C. Webb, Koputaroa	3 345	311·5	365	13,958·3	566·02
<i>Four-year-old.</i>						
Ivanhoe Fancy ..	A. M. Weir, Menzies Ferry	4 308	344·3	365	14,207·7	713·93
<i>Mature.</i>						
Ivanhoe Fillpail ..	A. M. Weir, Menzies Ferry	..	350·0	365	16,362·7	646·31

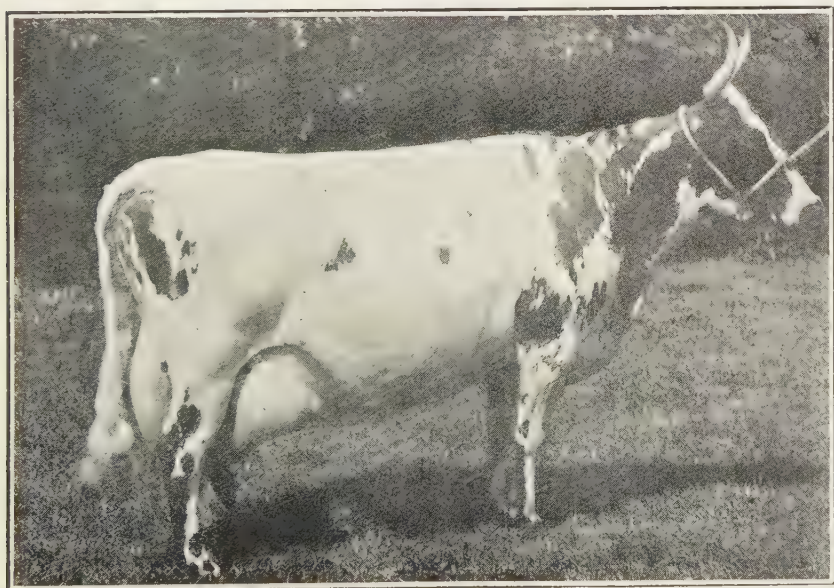
Ayrshire Class-averages.

Twenty Ayrshire cows gained certificates during the year. These twenty animals gave an average yield of 498·76 lb. butterfat, from 11,865·5 lb. milk, in 359 days. It is pleasing to be able to report an increase over the preceding year for each of the four classes into which the Ayrshire breed is divided. The extent of the increases will be seen in the following table:—

Class.		Number of Cows.	Average Yield for Season.		
			Days in Milk.	Milk.	Fat.
				lb.	lb.
1923.					
Two-year-old	..	4	365	10,986.1	438.63
Three-year-old	..	2	365	11,036.2	458.40
Four-year-old	..	4	365	11,166.2	500.52
Mature	..	10	353	12,663.0	530.19
1922.					
Two-year-old	..	4	342	8,981.7	384.71
Three-year-old	..	6	348	8,679.1	368.27
Four-year-old	..	2	354	11,266.9	487.55
Mature	..	11	345	11,797.2	486.58

Ayrshire C.O.R. Bulls.

For several years the Ayrshire breed had only one name in the C.O.R. bull class, that of King Cole. It is pleasing now to be able to record five bulls in this class. They are as follows: Dominion Netherton Good Bonus, seven C.O.R. daughters; King Cole, six daughters; Ben of Glenariff, four daughters; Jewel Prince of Wai-papa, four daughters; Maesgwyn Prince, four daughters. Now that the Ayrshire breed is securing so many fine records it is to be hoped that breeders will not be so tardy in entering their cows for C.O.R. test, and it is trusted that next year the list of bulls will be considerably lengthened.



IVANHOE FANCY (A. M. WEIR, MENZIES FERRY).

Leader of Ayrshire four-year-old class, and champion cow of the breed in New Zealand.

RED POLLS.

Four Red Polls gained first-class certificates-of-record during the year, and all are from the Central Development Farm herd of the Department of Agriculture at Weraroa. Individual records were published in last month's *Journal*. Each animal passed by a satisfactory margin the minimum butterfat requirement for her class. Two junior two-year-olds (one calving under two years of age) averaged 323.65 lb. butterfat, a junior three-year-old gave 322.99 lb. butterfat in 300 days, and a mature cow 468.40 lb. in 335 days.

SECOND-CLASS CERTIFICATES.

The second-class certificates-of-record issued during 1923 were distributed as follows: Jerseys, 21; Friesians, 6; Milking Shorthorns, 2; and Ayrshires, 1; making a total of 30. This number is so small, comparatively, as to represent an almost negligible percentage of the total certificates issued. It would appear, therefore, that breeders are making every endeavour to have their cows comply with the rule which provides that in order to gain a first-class certificate a cow must calve within fifteen months after the date of calving for commencement of test.

EXPORT OF PUREBRED DAIRY CATTLE.

The exports of purebred dairy cattle for 1923 totalled 203 animals, valued at a total of some £8,650. This represents an increase in numbers of 88, although in value there is an increase of only about £150. This lower average value is probably partly accounted for by the general decline in cattle values, and partly because a large proportion of the stock exported was comprised of calves and untested heifers. Judging by the figures for the past several years it would seem that New Zealand has now established the foundation of a fairly substantial export trade in dairy cattle. While we regret the loss of so many fine beasts, it is pleasing to recognize that the bulk of the stock leaving the country is of such quality as to build a sound reputation for New Zealand purebreds in the importing countries.

APPRECIATION.

The measure of success which has been attained by the C.O.R. testing has been largely contributed to by the co-operation of the several breeders' associations, of which the testing breeders are members. Much of the work of the breeders' associations in this connection must necessarily devolve on their secretaries. The Dairy Division's cordial acknowledgment of valued assistance cheerfully rendered is due to Messrs. W. M. Tapp, secretary, New Zealand Jersey Cattle Breeders' Association; J. M. Thomson, secretary, New Zealand Friesian Association; William Hunter, secretary, New Zealand Milking Shorthorn Breeders' Association; and R. H. Spencer, secretary, New Zealand Ayrshire Cattle Breeders' Association.

CLOSING LIST OF RECORDS FOR 1923.

The appended list was intended to finish the publication of records completed during the calendar year 1923. Owing, however, to the tardiness of some breeders in returning forms of declaration of milk-weights, &c., it may be necessary to publish a few outstanding names in a subsequent list.

Apart from Pretty's Flirt, whose record of 1,010 lb. butterfat has been previously noticed, the outstanding feature of this closing list is the appearance of two new class-leaders for the Ayrshire breed. Ivanhoe Fancy, with her fine performance of 713·93 lb. butterfat, becomes not only leader of the Ayrshire four-year-olds but champion of the breed in New Zealand. Ivanhoe Fillpail, in the mature class, has gained a certificate for 646·31 lb. butterfat, entitling her to the leadership of that class. She has also achieved the distinction of having given the highest milk-yield—16,362·7 lb.—for any Ayrshire yet certificated in the Dominion. These two animals are herd-mates and half-sisters, and are owned by Mr. A. M. Weir, of Menzies Ferry, Southland. They are the only two certificated daughters of Hindsward Jimmy of Townhead, who is by the imported bull Oxhill Jimmy. The dam of Ivanhoe Fillpail is Ivanhoe Curly 2nd, who has not been tested, but is sired by King Cole, a well-known Ayrshire bull who has sired six C.O.R. daughters, including Minnie of Glenweir, who has a certificate for 528·92 lb. butterfat. Ivanhoe Fancy is from Cole's Fancy of Glenweir, who has a certificate for 514·87 lb. as a mature cow. Cole's Fancy of Glenweir is also by King Cole, so that there is 75 per cent. similar breeding between these two cows. Mr. Weir is to be congratulated upon the success of the breeding plan which has resulted in these two outstanding individuals.

LIST OF RECORDS.

*Cow milked three times daily during whole lactation period. † Milked three times daily during part of period.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.

JERSEYS.						
		Yrs. dys.	lb.		lb.	lb.
<i>Junior Two-year-old.</i>						
Erinview's Treasure ..	John Murray, Woodville ..	2 15	242·0	365	9,474·5	552·37
Koro Koro Buttercup ..	R. W. Southee, Kiwitea ..	1 363	240·5	365	9,055·7	520·93
Fair's Cherrymaid ..	James Nicolson, Kaupokonui ..	1 318	240·5	365	9,302·5	500·13
Anzac's Heroine ..	H. J. Berry, Kaupokonui ..	2 2	240·7	365	8,391·3	494·98
Ohio Bilberry ..	A. H. Guy, Mangatoki ..	2 50	246·1	365	7,642·2	490·06
Koro Koro Nellie ..	R. W. Southee, Kiwitea ..	2 34	243·9	365	8,443·4	485·27
Koro Koro Pansy ..	R. W. Southee, Kiwitea ..	2 62	246·7	365	8,264·1	470·46
Wairua Frano ..	A. L. Dermer, Stanway ..	1 341	240·5	365	8,499·3	460·09
Raithwaite Superior ..	H. H. Buxton, Auroa ..	1 330	240·5	365	8,775·0	452·43
Meadowvale Uniform ..	F. A. Corney, Egmont Village ..	2 47	245·2	365	8,958·5	446·47
Raithwaite Briar's Girl ..	H. H. Buxton, Auroa ..	1 352	240·5	365	7,737·0	405·59
Waipiko Madge ..	F. E. Mills, Stanway ..	2 22	242·7	312	7,876·4	401·62
Tirohanga Lady Gold ..	E. C. Houchen, Hamilton ..	2 41	244·6	365	7,720·1	382·93
Orielton Sunshine ..	B. Tripp, Gleniti ..	1 358	240·5	365	7,153·7	368·34
Raithwaite Rose ..	H. H. Buxton, Auroa ..	1 250	240·5	329	7,142·3	364·16
Ohio Golden Lenora ..	A. H. Guy, Mangatoki ..	2 61	246·6	352	6,746·8	361·67
Niobe ..	C. Parker, Hairini ..	1 340	240·5	342	5,880·6	354·10

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.

JERSEYS—continued.

<i>Junior Two-year-old—continued.</i>		Yrs. dys.	lb.	lb.	lb.	
Anzac's Maid ..	H. J. Berry, Kaupokonui ..	1 312	240.5	365	6,225.2	351.71
Pine Bank Silver Link ..	J. Meuli, Normanby ..	1 261	240.5	365	5,500.1	331.30
Colleen Machree ..	C. Stevens, Maungatapere ..	1 356	240.5	365	6,378.6	321.17
Tinsel's Lady Twylish ..	Edgar Hofmann, Katikati ..	1 313	240.5	365	5,542.0	319.02
Cruiskeen's Majesty ..	C. Stevens, Maungatapere ..	1 361	240.5	365	5,570.4	317.65
Celebrity's Darling ..	A. Mouldey, Tirau ..	2 61	240.5	358	4,739.9	309.34
Victoria of Bull's ..	W. J. Spooner, Awapuni ..	2 31	243.5	348	6,052.0	306.66
Powhiri ..	O. Monrad, Palmerston N. ..	1 326	240.5	336	5,414.7	306.38
Sunny Meadows Eve ..	F. J. Wyatt, Towai ..	1 334	240.5	355	5,357.5	303.76
Fox's Nobility Pearl ..	W. H. Jakins, Christchurch ..	2 5	241.0	365	5,241.4	290.67
Springbank Dorothea ..	E. S. Holdaway, Ballance ..	1 325	240.5	351	5,357.0	288.39
Springbank Ally's Hope ..	E. S. Holdaway, Ballance ..	1 336	240.5	323	5,967.1	276.19
Springbank Lady ..	E. S. Holdaway, Ballance ..	1 349	240.5	294	5,223.8	262.52
Springbank Kitten ..	E. S. Holdaway, Ballance ..	2 0	240.5	311	5,077.6	259.68
Springbank Jocelyn ..	E. S. Holdaway, Ballance ..	1 347	240.5	365	4,688.4	249.78
<i>Senior Two-year-old.</i>						
Genii ..	C. Stevens, Maungatapere ..	2 354	275.9	365	8,159.1	459.71
Beauty's Mignonne ..	D. L. A. Astbury, Mangatoki ..	2 349	275.4	330	6,686.4	430.73
Springbank Re Veale ..	E. S. Holdaway, Ballance ..	2 263	266.8	275	5,146.4	281.92
<i>Three-year-old.</i>						
Marjorie's Twylish ..	John Murray, Woodville ..	3 342	311.2	365	11,388.5	655.45
August's Cherrybud ..	J. Nicolson, Kaupokonui ..	3 54	282.4	365	10,333.4	634.45
Comely of Rosy Creek ..	L. Wickham, New Plymouth ..	3 20	279.0	358	11,218.5	616.94
Erinview Queen ..	John Murray, Woodville ..	3 19	278.9	365	10,154.0	535.93
Abberly Naomi ..	H. E. B. Watson, Fendalton ..	3 43	281.3	365	10,516.4	531.49
Arietta ..	Dr. H. O. Washbourn, Richmond ..	3 56	282.5	365	10,790.5	510.90
Roslyn Sweetest ..	T. Brownlee, Pukekohe ..	3 90	286.0	365	8,445.9	487.39
Lassie Lucerne ..	W. McGowan, Papatoetoe ..	3 240	301.0	341	8,626.5	428.73
Lakeside Magnet ..	V. W. Nowell, Hawera ..	3 6	277.6	321	6,953.0	425.98
Woodstock's Leitha ..	Banks and Son, Kiwitea ..	3 76	284.6	365	7,137.4	394.62
Woodstock's Zara ..	Banks and Son, Kiwitea ..	3 65	283.5	365	7,748.7	370.02
Springbank Faith ..	E. S. Holdaway, Ballance ..	3 190	290.0	293	5,668.2	299.79
Venus's Delight ..	Edgar Hofmann, Katikati ..	3 12	278.2	338	5,797.4	286.71
Springbank Duchess ..	E. S. Holdaway, Ballance ..	3 50	282.0	323	6,056.3	283.66
<i>Four-year-old.</i>						
Best of All ..	H. H. Buxton, Auroa ..	4 53	318.8	342	10,697.2	582.15
Aster's Rainbow ..	J. Nicolson, Kaupokonui ..	4 78	321.3	365	10,253.4	521.60
Rewa Saint ..	W. H. Booth, Carterton ..	4 35	317.0	365	10,344.2	507.30
Waipiko Leonne ..	C. G. C. Dermer, Waipiko ..	4 46	318.1	365	9,410.1	495.81
You'll do Soumise ..	A. H. Guy, Mangatoki ..	4 6	314.1	365	9,689.2	494.99
Majesty's Orange Fox ..	F. S. Veale, Cambridge ..	4 41	317.6	342	9,058.3	440.67
Rewa Maycan ..	H. E. B. Watson, Fendalton ..	4 11	314.5	261	6,726.6	401.04
Broady's Tinsel ..	Edgar Hofmann, Katikati ..	4 108	324.3	306	5,326.8	327.80
<i>Mature.</i>						
Pretty's Flirt* ..	W. H. Miers, Rukuhia ..	6 353	350.0	365	16,684.1	1010.49
Frances ..	A. L. Dermer, Stanway ..	6 5	350.0	365	11,889.7	735.51
Koro Koro's Silky ..	R. W. Southee, Kiwitea ..	5 346	350.0	365	11,451.3	612.57
Flotsam ..	A. L. Dermer, Stanway ..	9 146	350.0	365	11,962.2	599.74
Waipiko Caress ..	C. G. C. Dermer, Waipiko ..	5 51	350.0	365	9,279.4	567.29
Laurel's Dove ..	John Murray, Woodville ..	5 25	350.0	360	10,211.0	550.62



ALFALFA PANSY (F. J. SAXBY, OHAUPO).

Leader of the Jersey junior two-year-old class. C.O.R. 1923: 10,898.1 lb. milk, 690.16 lb. butterfat.



ZOLA OF ROSY CREEK (E. JOYCE, KAPONGA).

Leader of the Jersey three-year-old class. C.O.R. 1923: 12,478.6 lb. milk, 741.2 lb. butterfat.

LIST OF RECORDS—*continued*.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
JERSEYS—continued.						
Mature—continued.		Yrs. dys.	lb.		lb.	lb.
Ethel's Creamy Lass	L. K. Tarrant, Ngaere	7 55	350.0	292	9,248.6	536.18
Oakvale's Grace	A. H. Guy, Mangatoki	6 96	350.0	365	8,940.2	516.05
Golden Fern	C. Stevens, Maungatapere	9 109	350.0	365	10,150.6	489.49
Olga's Darling	A. Mouldey, Tirau	8 38	350.0	355	8,974.8	486.24
Waratah Tinsel	E. Hofmann, Katikati	6 24	350.0	365	8,924.9	484.11
Laurel's Bright Hope	John Murray, Woodville	7 44	350.0	365	7,923.5	480.61
Pretty Lass	John Hale, New Plymouth	6 7	350.0	365	8,351.4	472.21
Cowslip 9th	W. T. Williams, Pukehou	9 120	350.0	365	9,557.5	469.49
Lady Joffre	E. L. Roose, Pukekohe	7 326	350.0	364	9,946.2	439.45
Middlewood's Queen	Banks and Son, Kiwitea	6 104	350.0	365	6,763.9	394.72
Victoria's Success	B. Tripp, Gleniti.	9 339	350.0	298	7,032.3	387.72
Lady Swan	A. Best, Bombay	11 83	350.0	365	8,350.0	374.52

FRIESIANS.

<i>Junior Two-year-old.</i>						
Bainfield Topsy 13th*	W. D. Hunt, Waikiwi	2 34	243.0	365	15,061.0	641.88
Bainfield Pansy 3rd*	W. D. Hunt, Waikiwi	2 174	257.9	365	14,708.8	609.34
Dominion Queen Olga	Central Development Farm, Weraroa	2 57	246.2	365	12,985.7	460.12
Tokaora Beets Sunshine†	H. E. Johnson, Tokaora	2 35	244.0	365	10,455.7	458.47
Oaklea Creamelle*	R. A. Wilson, Turakina	2 82	248.7	365	14,033.1	439.94
Tokaora Netherland Rose†	H. E. Johnson, Tokaora	2 77	248.2	327	12,358.2	436.26
Tokaora Manor Beets*	H. E. Johnson, Tokaora	2 80	248.5	336	11,591.7	413.57
Countess Ena Hero†.	N. P. Nielsen, Tiakitahuna	2 53	245.8	365	12,090.6	411.01
Oaklea Mercena Lassie†	R. A. Wilson, Turakina	2 22	242.7	292	8,866.7	374.53
Ashlynn 118th	J. H. Jamieson, Fencourt	2 4	240.9	365	9,036.4	364.71
Oaklea Pauline de Kolt†	Knight and Sons, Ongarue	2 96	250.1	336	9,964.3	360.87
Lady Van Cleve Gem†	N. P. Nielsen, Tiakitahuna	1 295	240.5	364	10,575.1	343.07
Mahoe Nancy Lee†	R. A. Wilson, Turakina	1 251	240.5	322	10,057.5	333.75
Dominion Spot 6th	Central Development Farm, Weraroa	2 66	247.1	343	8,315.8	330.38
Tunanui Domino Mechthilde†	R. A. Wilson, Turakina	1 309	240.5	318	9,333.1	325.52
Oaklea Minto Millbrook†	Knight and Sons, Ongarue	2 54	245.9	285	8,277.6	288.48
Penrest Daisy of Fencourt	J. H. Jamieson, Cambridge	2 18	242.3	360	8,497.4	253.83

<i>Senior Two-year-old.</i>						
Knight Pauline Alcartra†	S. Andrew, Kaikoura	2 217	262.2	365	13,769.6	439.94

<i>Junior Three-year-old.</i>						
Monarch Queen Jessie	W. D. Hunt, Waikiwi	3 51	282.1	365	14,728.6	578.08
Duchess Abbeckerk 2nd†	Voss Bros., Longburn	3 107	287.7	355	10,010.3	368.24

<i>Senior Three-year-old.</i>						
Pauline de Kol Fayne*	R. A. Wilson, Turakina	3 245	301.5	365	15,523.3	598.48
Dominion Miss Mierlo	Central Development Farm, Weraroa	3 352	312.2	314	17,106.5	579.69

<i>Junior Four-year-old.</i>						
Friesland Model Maid*	A. S. Elworthy, Timaru	4 152	328.7	365	13,668.5	394.76

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
FRIESIANS— <i>continued.</i>						
<i>Senior Four-year-old.</i>		Yrs. dys.	lb.		lb.	lb.
Monavale Dairymaid Paxton*	W. D. Hunt, Waikiwi	.. 4 361	349·6	365	20,146·3	712·10
Longbeach Transvaal Princess*	J. H. Grigg, Longbeach	.. 4 304	343·9	364	21,126·0	584·76
<i>Mature.</i>						
Rosevale Stella*	.. North and Sons, Omimi	.. 6 63	350·0	365	22,002·7	743·17
Eileen Girl*	.. A. W. Chapman, Gordonton	.. 8 23	350·0	365	21,085·5	704·93
Clothilde Alcartra Fayne*	A. W. Chapman, Gordonton	7 10	350·0	365	20,566·3	654·57
Pauline Acme 3rd*	.. G. F. Court, Panmure	.. 10 271	350·0	365	21,593·2	633·58
Tinie Grant 3rd*	.. G. F. Court, Panmure	.. 7 6	350·0	365	19,640·9	632·04
Jules Colantha of Friesian Holm*	John Stables, Riverlea	.. 9 4	350·0	326	12,716·7	524·61
Monavale Evergreen Paxton†	S. Clements, Rototuna	.. 6 85	350·0	302	13,293·8	506·52
AYRSHIRES.						
<i>Three-year-old.</i>						
Zandie of Waipapa	.. Fred. Mills, Waipapa	.. 3 311	301·1	365	10,316·5	419·01
<i>Four-year-old.</i>						
Ivanhoe Fancy†	.. A. M. Weir, Menzies Ferry	4 308	344·3	365	14,207·7	713·93
<i>Mature.</i>						
Ivanhoe Fillpail*	.. A. M. Weir, Menzies Ferry	..	350·0	305	16,362·7	646·31



DIMPLE OF EDENDALE (W. HALL, LEPPERTON).

Leader of the Ayrshire two-year-old class, C.O.R. 1923: 13,063·3 lb. milk, 529·46 lb. butterfat.

LIST OF RECORDS—*continued*.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
MILKING SHORTHORNS.						
<i>Junior Two-year-old.</i>		Yrs. dys.	lb.		lb.	lb.
Pine Farm Harriet 1st	James Parkinson, Opotiki ..	2 6	241·1	365	15,273·3	552·85
<i>Senior Two-year-old.</i>						
Dilworth Eclipse ..	J. W. Robinson, Runciman	2 339	274·4	345	7,777·3	311·95
<i>Junior Four-year-old.</i>						
Hukerewai Rona ..	J. W. Robinson, Runciman	4 19	315·4	365	10,192·4	379·99
<i>Mature.</i>						
Ardwell Dolly ..	J. W. Robinson, Runciman	..	350	295	10,306·0	376·34

Second-class Certificates.

JERSEYS.

<i>Three-year-old.</i>						
Rewa Arabis ..	G. B. Hull, Silverstream ..	3 28	279·8	365	9,255·3	475·45
<i>Mature.</i>						
Caprice ..	A. L. Dermer, Stanway ..	6 243	350·0	365	8,403·1	506·93

FRIESIANS.

<i>Senior Two-year-old.</i>						
Rai Alcartra* ..	S. Andrew, Kaikoura ..	2 289	269·4	365	14,076·2	455·07
Pareora Transvaal Fancy*	A. S. Elworthy, Timaru ..	2 314	271·9	365	11,744·5	450·42

MILKING SHORTHORNS.

<i>Mature.</i>						
Hoeka Mary ..	Ranstead Bros., Matangi ..	..	350·0	365	13,678·9	498·51
Matangi Geraldine ..	Ranstead Bros., Matangi ..	..	350·0	365	11,471·0	437·96

Seed Research Work carried out at the Biological Laboratory, Wellington, is summarized as follows in the annual report of the Department of Agriculture for 1922-23: Research work upon the cause of and overcoming the loss of vitality in Chewings fescue seed during and after overseas shipment is still being continued. With the data attained from experiments carried out in co-operation with the United States Department of Agriculture, together with that from a series of experiments now being commenced, it is hoped that the New Zealand Department will very soon be in a position to advise merchants, so that they may ship Chewings fescue with confidence. Various other researches in matters relating to seed work generally have been carried out as follows: Increasing germination of rye-grass by drying process; storage of Chewings fescue under cool storage and subsequently higher temperatures; improved methods of testing peas and beans; co-operation with English seed firms in research into the loss of vitality of seeds during import and export; standardization of source-indicators of agricultural seeds (in co-operation with the Seed Control Station, Zurich, Switzerland); standardization of methods of seed-analysis (in co-operation with the Royal Seed Control Station, Copenhagen, Denmark); statistical study of seed impurities and germination behaviour of New-Zealand-grown agricultural seeds.

RABBIT-POISONING WITH PHOSPHORIZED POLLARD AND GRAIN.

Live-stock Division.

PHOSPHORIZED POLLARD.

Recipe No. 1.—Boil 3 quarts. of water and $4\frac{1}{2}$ lb. of brown sugar in a clean oil-drum or kerosene-tin. When the liquor is boiling take it off the fire and put in two sticks of phosphorus (about 4 oz.). After allowing a minute or so for the phosphorus to thoroughly dissolve, boil the whole again. Then lift it off the fire, and immediately begin stirring-in pollard. Stir hard, as this is the time to get the phosphorus well distributed. Continue adding pollard until the mass becomes sufficiently stiff for kneading.

For large quantities the proportions required are as follows: 18 lb. sugar, 1 lb. phosphorus, 3 gallons water, with sufficient pollard (about 60 lb.) to make a stiff dough.

Recipe No. 2.—Mix, in a pickle-bottle or a tin with a tight-fitting lid, 1 tablespoonful of bisulphide of carbon and $1\frac{1}{2}$ sticks of phosphorus with $\frac{1}{2}$ pint of cold water. Allow this to stand till the phosphorus is thoroughly dissolved. In $3\frac{1}{2}$ pints of hot water dissolve 3 lb. of sugar. Pour both these liquors into a clean vessel and stir well; then add pollard until the dough becomes stiff enough for kneading.

For large quantities the proportions required are as follows: 4 tablespoonfuls (2 oz.) bisulphide of carbon, 16 lb. to 18 lb. sugar, 1 lb. phosphorus, 11 quarts water, and sufficient pollard (about 60 lb.) to make the dough stiff enough for kneading and dividing into cubes.

With either recipe if the weather is extremely dry it is better to use one-third less sugar, and substitute an equal weight of treacle. This will prevent undue hardening.

Preparing the Baits.—Use a clean board and roller, and keep them well dusted with dry pollard. Take a quantity of the dough out of the vessel with a spade or flat stick, throw dry pollard on it to stop any sparking, knead it, and roll it out to $\frac{1}{4}$ in. thickness. Then cut it into $\frac{1}{2}$ in. squares, and throw the ragged edges back into the vessel. Gather up the squares and place them in a shallow box or tray, sprinkle over with some dry pollard, and allow them to dry out before tinning up or using.

When making large quantities, by hand, the cutting is generally done with a disc-roller cutter. A poison-mixing machine is also on the market, which does the whole of the mixing and cutting into cubes. This machine is suitable when large quantities of poison are being manufactured.

Laying the Poison.—One way of laying the poison is by turning a sod with a spade or adze, and placing one or two squares on top of it. Some prefer placing the baits in the holes made by the spade or adze. Another way is to lay them at intervals in a plough-furrow. The number of baits laid must be according to the state of the rabbit pest.

On bare run-country the poison may be laid without using spade, adze, or plough, the baits being dropped on the barer patches of ground. This method has proved satisfactory in many cases, but more poisoned baits require to be laid than with the other methods, as there is no freshly turned earth to attract the rabbit to the baits.

PHOSPHORIZED GRAIN.

Recipe and Preparation.—Take 120 lb. of grain, 18 sticks (2 lb. 4 oz.) of phosphorus, and $4\frac{1}{2}$ to 5 gallons of water; 9 lb. of sugar is also added in most cases, but the poison is said by some users to be equally well taken without this. The water is boiled in an iron cylinder, which is fitted with a spindle and set up on iron posts or frame, a fire being lighted beneath it. When the water is boiling the phosphorus is put in and stirred until every particle is thoroughly dissolved, after which the grain is poured in and the lid screwed on tightly. The cylinder is then turned slowly and steadily for twenty minutes or more (the fire being put out after about ten minutes turning), again turned for a few minutes every half-hour for an hour or two, and then given a few turns several times during the remainder of the day. The poison should be left in the drum for at least twenty-four hours if possible, and preferably a little longer. If taken out too soon the fumes are very strong and dense and unhealthy to work in, and it takes twenty-four hours to thoroughly impregnate the grain with the phosphorus.

Where no iron cylinder is available the grain can be boiled in clean drums or petrol-tins for ten minutes, and then put into a barrel with spindle and turning-handle affixed and set on a frame or posts. This barrel must be provided with a manhole on its side, which must be fitted with an airtight lid to prevent leakage of fumes. The barrel should be rotated at intervals in the manner explained above, and left for at least twenty-four hours before removal of the poisoned grain.

Some makers prefer to soak the grain (especially if barley is used) for twenty-four hours in cold water before boiling, in which case less than the above-stated quantity of water will be required for boiling it. In connection with the sugar constituent, some prefer not to boil this with the grain, but to mix it with the poisoned grain on the day of laying.

If kept in an airtight container the poisoned grain will remain good for some time.

Laying the Poison.—Lay the rows about a chain apart, and deposit on barest parts of the ground about a dozen grains every few yards. In many cases it will be found advisable to lay the grain on freshly turned sods or in plough-furrows.

GENERAL POINTS.

Stock should be removed before laying the poison.

Phosphorus should always be kept in water, and, for greater safety, away from buildings. Bisulphide of carbon should be securely corked, and stored in a cool place, as the fumes are dangerous if inhaled.

A READY-RECKONER FOR WEIGHT OF FIELD CROPS PER ACRE.

(Continued.)

TABLE SHOWING WEIGHT OF CROP PER ACRE WHEN THE AREA FROM WHICH THE PRODUCE IS TAKEN IS 1 CHAIN IN 24 IN. DRILLS—EQUIVALENT TO $\frac{1}{30}$ ACRE.

Weight per Area	Weight per Acre.	Weight per Area	Weight per Acre.	Weight per Area	Weight per Acre.	Weight per Area	Weight per Acre.
lb.	Tons cwt. qr. lb.	lb.	Tons cwt. qr. lb.	lb.	Tons cwt. qr. lb.	lb.	Tons cwt. qr. lb.
1	0 2 3 22	61	8 19 2 26	121	17 16 2 2	181	26 13 1 6
2	0 5 3 16	62	9 2 2 20	122	17 19 1 24	182	26 16 1 0
3	0 8 3 10	63	9 5 2 14	123	18 2 1 18	183	26 19 0 22
4	0 11 3 4	64	9 8 2 8	124	18 5 1 12	184	27 2 0 16
5	0 14 2 26	65	9 11 2 2	125	18 8 1 6	185	27 5 0 10
6	0 17 2 20	66	9 14 1 24	126	18 11 1 0	186	27 8 0 4
7	1 0 2 14	67	9 17 1 18	127	18 14 0 22	187	27 10 3 26
8	1 3 2 8	68	10 0 1 12	128	18 17 0 16	188	27 13 3 20
9	1 6 2 2	69	10 3 1 6	129	19 0 0 10	189	27 16 3 14
10	1 9 1 24	70	10 6 1 0	130	19 3 0 4	190	27 19 3 8
11	1 12 1 18	71	10 9 0 22	131	19 5 3 26	191	28 2 3 2
12	1 15 1 12	72	10 12 0 16	132	19 8 3 20	192	28 5 2 24
13	1 18 1 6	73	10 15 0 10	133	19 11 3 14	193	28 8 2 18
14	2 1 1 0	74	10 18 0 4	134	19 14 3 8	194	28 11 2 12
15	2 4 0 22	75	11 0 3 26	135	19 17 3 2	195	28 14 2 6
16	2 7 0 16	76	11 3 3 20	136	20 0 2 24	196	28 17 2 0
17	2 10 0 10	77	11 6 3 14	137	20 3 2 18	197	29 0 1 22
18	2 13 0 4	78	11 9 3 8	138	20 6 2 12	198	29 3 1 16
19	2 15 3 26	79	11 12 3 2	139	20 9 2 6	199	29 6 1 0
20	2 18 3 20	80	11 15 2 24	140	20 12 2 0	200	29 9 1 4
21	3 1 3 14	81	11 18 2 18	141	20 15 1 22	201	29 12 0 26
22	3 4 3 8	82	12 1 2 12	142	20 18 1 6	202	29 15 0 20
23	3 7 3 2	83	12 4 2 6	143	21 1 1 0	203	29 18 0 14
24	3 10 2 24	84	12 7 2 0	144	21 4 1 4	204	30 1 0 8
25	3 13 2 18	85	12 10 1 22	145	21 7 0 26	205	30 4 0 2
26	3 16 2 12	86	12 13 1 16	146	21 10 0 20	206	30 6 3 24
27	3 19 2 6	87	12 16 1 10	147	21 13 0 14	207	30 9 3 18
28	4 2 2 0	88	12 19 1 4	148	21 16 0 8	208	30 12 3 12
29	4 5 1 22	89	13 2 0 26	149	21 19 0 2	209	30 15 3 6
30	4 8 1 16	90	13 5 0 20	150	22 1 3 24	210	30 18 3 0
31	4 11 1 10	91	13 8 0 14	151	22 4 3 18	211	31 1 2 22
32	4 14 1 4	92	13 11 0 8	152	22 7 3 12	212	31 4 2 16
33	4 17 0 26	93	13 14 0 2	153	22 10 3 6	213	31 7 2 10
34	5 0 0 20	94	13 16 3 24	154	22 13 3 0	214	31 10 2 4
35	5 3 0 14	95	13 19 3 18	155	22 16 2 22	215	31 13 1 26
36	5 6 0 8	96	14 2 3 12	156	22 19 2 16	216	31 16 1 20
37	5 9 0 2	97	14 5 3 6	157	23 2 2 10	217	31 19 1 14
38	5 11 3 24	98	14 8 3 0	158	23 5 2 4	218	32 2 1 8
39	5 14 3 18	99	14 11 2 22	159	23 8 1 26	219	32 5 1 12
40	5 17 3 12	100	14 14 2 16	160	23 11 1 20	220	32 8 0 24
41	6 0 3 6	101	14 17 2 10	161	23 14 1 14	221	32 11 0 18
42	6 3 3 0	102	15 0 2 4	162	23 17 1 8	222	32 14 0 12
43	6 6 2 22	103	15 3 1 26	163	24 0 1 2	223	32 17 0 6
44	6 9 2 16	104	15 6 1 20	164	24 3 0 24	224	33 0 0 0
45	6 12 2 10	105	15 9 1 14	165	24 6 0 18	225	33 2 3 22
46	6 15 2 4	106	15 12 1 8	166	24 9 0 12	226	33 5 3 16
47	6 18 1 26	107	15 15 1 2	167	24 12 0 6	227	33 8 3 10
48	7 1 1 20	108	15 18 0 24	168	24 15 0 0	228	33 11 3 4
49	7 4 1 14	109	16 1 0 18	169	24 17 3 22	229	33 14 2 26
50	7 7 1 8	110	16 4 0 12	170	25 0 3 16	230	33 17 2 20
51	7 10 1 2	111	16 7 0 6	171	25 3 3 10	231	34 0 2 14
52	7 13 0 24	112	16 10 0 0	172	25 6 3 4	232	34 3 2 8
53	7 16 0 18	113	16 12 3 22	173	25 9 2 26	233	34 6 2 2
54	7 19 0 12	114	16 15 3 16	174	25 12 2 20	234	34 9 1 24
55	8 2 0 6	115	16 18 3 10	175	25 15 2 14	235	34 12 1 18
56	8 5 0 0	116	17 1 3 4	176	25 18 2 8	236	34 15 1 12
57	8 8 3 22	117	17 4 2 26	177	26 1 2 2	237	34 18 1 6
58	8 10 3 16	118	17 7 2 20	178	26 4 1 24	238	35 1 1 0
59	8 13 3 10	119	17 10 2 14	179	26 7 1 18	239	35 4 0 22
60	8 16 3 4	120	17 13 2 8	180	26 10 1 12	240	35 7 0 16

TABLE SHOWING WEIGHT OF CROP PER ACRE—*continued.*

Weight per Area.	Weight per Acre.	Weight per Area.	Weight per Acre.	Weight per Area.	Weight per Acre.	Weight per Area.	Weight per Acre.
lb.	Tons cwt. qr. lb.	lb.	Tons cwt. qr. lb.	lb.	Tons cwt. qr. lb.	lb.	Tons cwt. qr. lb.
241	35 10 0 10	319	40 19 3 18	397	58 9 2 26	475	69 19 2 6
242	35 13 0 4	320	47 2 3 12	398	58 12 2 20	476	70 2 2 0
243	35 15 3 26	321	47 5 3 6	399	58 15 2 14	477	70 5 1 22
244	35 18 3 20	322	47 8 3 0	400	58 18 2 8	478	70 8 1 16
245	36 1 3 14	323	47 11 2 22	401	59 1 2 2	479	70 11 1 10
246	36 4 3 8	324	47 14 2 16	402	59 4 1 24	480	70 14 1 4
247	36 7 3 2	325	47 17 2 10	403	59 7 1 18	481	70 17 0 26
248	36 10 2 24	326	48 0 2 4	404	59 10 1 12	482	71 0 0 20
249	36 13 2 18	327	48 3 1 26	405	59 13 1 6	483	71 3 0 14
250	36 16 2 12	328	48 6 1 20	406	59 16 1 0	484	71 6 0 8
251	36 19 2 6	329	48 9 1 14	407	59 19 0 22	485	71 9 0 2
252	37 2 2 0	330	48 12 1 8	408	60 2 0 16	486	71 11 3 24
253	37 5 1 22	331	48 15 1 2	409	60 5 0 10	487	71 14 3 18
254	37 8 1 16	332	48 18 0 24	410	60 8 0 4	488	71 17 3 12
255	37 11 1 10	333	49 1 0 18	411	60 10 3 26	489	72 0 3 6
256	37 14 1 4	334	49 4 0 12	412	60 13 3 20	490	72 3 3 0
257	37 17 0 26	335	49 7 0 6	413	60 16 3 14	491	72 6 2 22
258	38 0 0 20	336	49 10 0 0	414	60 19 3 8	492	72 9 2 16
259	38 3 0 14	337	49 12 3 22	415	61 2 3 2	493	72 12 2 10
260	38 6 0 8	338	49 15 3 16	416	61 5 2 24	494	72 15 2 4
261	38 9 0 2	339	49 18 3 10	417	61 8 2 18	495	72 18 1 26
262	38 11 3 24	340	50 1 3 4	418	61 11 2 12	496	73 1 1 20
263	38 14 3 18	341	50 4 2 26	419	61 14 2 6	497	73 4 1 14
264	38 17 3 12	342	50 7 2 20	420	61 17 2 0	498	73 7 1 8
265	39 0 3 6	343	50 10 2 14	421	62 0 1 22	499	73 10 1 2
266	39 3 3 0	344	50 13 2 8	422	62 3 1 16	500	73 13 0 24
267	39 6 2 22	345	50 16 2 2	423	62 6 1 10	501	73 16 0 18
268	39 9 2 16	346	50 19 1 24	424	62 9 1 4	502	73 19 0 12
269	39 12 2 10	347	51 2 1 18	425	62 12 0 26	503	74 2 0 6
270	39 15 2 4	348	51 5 1 12	426	62 15 0 20	504	74 5 0 0
271	39 18 1 26	349	51 8 1 6	427	62 18 0 14	505	74 7 3 22
272	40 1 1 20	350	51 11 1 0	428	63 1 0 8	506	74 10 3 16
273	40 4 1 14	351	51 14 0 22	429	63 4 0 2	507	74 13 3 10
274	40 7 1 8	352	51 17 0 16	430	63 7 3 24	508	74 16 3 4
275	40 10 1 2	353	52 0 0 10	431	63 9 3 18	509	74 19 2 26
276	40 13 0 24	354	52 3 0 4	432	63 12 3 12	510	75 2 2 20
277	40 16 0 18	355	52 5 3 26	433	63 15 3 6	511	75 5 2 14
278	40 19 0 12	356	52 8 3 20	434	63 18 3 0	512	75 8 2 8
279	41 2 0 6	357	52 11 3 14	435	64 1 2 22	513	75 11 2 2
280	41 5 0 0	358	52 14 3 8	436	64 4 2 16	514	75 14 2 24
281	41 7 3 22	359	52 17 3 2	437	64 7 2 10	515	75 17 1 18
282	41 10 3 16	360	53 0 2 24	438	64 10 2 4	516	76 0 1 12
283	41 13 3 10	361	53 3 2 18	439	64 13 1 26	517	76 3 1 6
284	41 16 3 4	362	53 6 2 12	440	64 16 1 20	518	76 6 1 0
285	41 19 2 26	363	53 9 2 6	441	64 19 1 14	519	76 9 0 22
286	42 2 2 20	364	53 12 2 0	442	65 2 1 8	520	76 12 0 16
287	42 5 2 14	365	53 15 1 22	443	65 5 1 2	521	76 15 0 10
288	42 8 2 8	366	53 18 1 6	444	65 8 0 24	522	76 18 0 4
289	42 11 2 2	367	54 1 1 0	445	65 11 0 18	523	77 0 3 26
290	42 14 1 24	368	54 4 1 4	446	65 14 0 12	524	77 3 3 20
291	42 17 1 18	369	54 7 0 26	447	65 17 0 6	525	77 6 3 14
292	43 0 1 12	370	54 10 0 20	448	66 0 0 0	526	77 9 3 8
293	43 3 1 6	371	54 13 0 14	449	66 2 3 22	527	77 12 3 2
294	43 6 1 0	372	54 16 0 8	450	66 5 3 16	528	77 15 2 24
295	43 9 0 22	373	54 19 0 2	451	66 8 3 10	529	77 18 2 18
296	43 12 0 16	374	55 1 3 24	452	66 11 3 4	530	78 1 2 12
297	43 15 0 10	375	55 4 3 18	453	66 14 2 26	531	78 4 2 6
298	43 18 0 4	376	55 7 3 12	454	66 17 2 20	532	78 7 2 0
299	44 0 3 26	377	55 10 3 6	455	67 0 2 14	533	78 10 1 22
300	44 3 3 20	378	55 13 3 0	456	67 3 2 8	534	78 13 1 16
301	44 6 3 14	379	55 16 2 22	457	67 6 2 2	535	78 16 1 10
302	44 9 3 8	380	55 19 2 16	458	67 9 1 24	536	78 19 1 4
303	44 12 3 2	381	56 2 2 10	459	67 12 1 18	537	79 2 0 26
304	44 15 2 24	382	56 5 2 4	460	67 15 1 12	538	79 5 0 20
305	44 18 2 18	383	56 8 1 26	461	67 18 1 6	539	79 8 0 14
306	45 1 2 12	384	56 11 1 20	462	68 1 1 0	540	79 11 0 8
307	45 4 2 6	385	56 14 1 14	463	68 4 0 22	541	79 14 0 2
308	45 7 2 0	386	56 17 1 8	464	68 7 0 16	542	79 17 3 24
309	45 10 1 22	387	57 0 1 2	465	68 10 0 10	543	79 19 3 18
310	45 13 1 16	388	57 3 0 24	466	68 13 0 4	544	80 2 3 12
311	45 16 1 10	389	57 6 0 18	467	68 15 3 26	545	80 5 3 6
312	45 19 1 4	390	57 9 0 12	468	68 18 3 20	546	80 8 3 0
313	46 2 0 26	391	57 12 0 6	469	69 1 3 14	547	80 11 2 22
314	46 5 0 20	392	57 15 0 0	470	69 4 3 8	548	80 14 2 16
315	46 8 0 14	393	57 17 3 22	471	69 7 3 2	549	80 17 2 10
316	46 11 0 8	394	58 0 3 16	472	69 10 2 24	550	81 0 2 4
317	46 14 0 2	395	58 3 3 10	473	69 13 2 18	551	81 3 1 16
318	46 16 3 24	396	58 6 3 4	474	69 16 2 12	552	81 6 1 20

TABLE SHOWING WEIGHT OF CROP PER ACRE—*continued*.

Weight per Area.	Weight per Acre.	Weight per Area.	Weight per Acre.	Weight per Area.	Weight per Acre.	Weight per Area.	Weight per Acre.
lb.	Tons cwt. qr. lb.	lb.	Tons cwt. qr. lb.	lb.	Tons cwt. qr. lb.	lb.	Tons cwt. qr. lb.
553	81 9 1 14	585	86 3 2 18	617	90 17 3 22	649	95 12 0 26
554	81 12 1 8	586	86 6 2 12	618	91 0 3 16	650	95 15 0 20
555	81 15 1 2	587	86 9 2 6	619	91 3 3 10	651	95 18 0 14
556	81 18 0 24	588	86 12 2 0	620	91 6 3 4	652	96 1 0 8
557	82 1 0 18	589	86 15 1 22	621	91 9 2 26	653	96 4 0 2
558	82 4 0 12	590	86 18 1 6	622	91 12 2 20	654	96 6 3 24
559	82 7 0 6	591	87 1 1 0	623	91 15 2 14	655	96 9 3 18
560	82 10 0 0	592	87 4 1 4	624	91 18 2 8	656	96 12 3 12
561	82 12 3 22	593	87 7 0 26	625	92 1 2 2	657	96 15 3 6
562	82 15 3 16	594	87 10 0 20	626	92 4 1 24	658	96 18 3 0
563	82 18 3 10	595	87 13 0 14	627	92 7 1 18	659	97 1 2 22
564	83 1 3 4	596	87 16 0 8	628	92 10 1 12	660	97 4 2 16
565	83 4 2 26	597	87 19 0 2	629	92 13 1 6	661	97 7 2 10
566	83 7 2 20	598	88 1 3 24	630	92 16 1 0	662	97 10 2 4
567	83 10 2 14	599	88 4 3 18	631	92 19 0 22	663	97 13 1 26
568	83 13 2 8	600	88 7 3 12	632	93 2 0 16	664	97 16 1 20
569	83 16 2 2	601	88 10 3 6	633	93 5 0 10	665	97 19 1 14
570	83 19 1 24	602	88 13 3 0	634	93 8 0 4	666	98 2 1 8
571	84 2 1 18	603	88 16 2 22	635	93 10 3 26	667	98 5 1 2
572	84 5 2 12	604	88 19 2 16	636	93 13 3 20	668	98 8 3 0 24
573	84 8 1 6	605	88 22 2 10	637	93 16 3 14	669	98 11 3 0 18
574	84 11 1 0	606	89 5 2 4	638	93 19 3 8	670	98 14 3 0 12
575	84 14 0 22	607	89 8 1 26	639	94 2 3 2	671	98 17 3 0 6
576	84 17 0 16	608	89 11 1 20	640	94 5 2 24	672	99 0 3 0 0
577	85 0 0 10	609	89 14 1 14	641	94 8 2 18	673	99 2 3 0 22
578	85 3 0 4	610	89 17 1 8	642	94 11 2 12	674	99 5 3 0 16
579	85 5 3 26	611	90 0 1 2	643	94 14 2 6	675	99 8 3 0 10
580	85 8 3 20	612	90 3 0 24	644	94 17 2 0	676	99 11 3 0 4
581	85 11 3 14	613	90 6 0 18	645	95 0 1 22	677	99 14 2 26
582	85 14 3 8	614	90 9 0 12	646	95 3 1 6	678	99 17 2 20
583	85 17 3 2	615	90 12 0 6	647	95 6 1 0	679	100 0 2 14
584	86 0 2 24	616	90 15 0 0	648	95 9 1 4		

—C. H. Schwass. *Fields Division, Wellington.*

(To be continued.)

RESTRICTIONS ON IMPORTATION OF LIVE-STOCK.

From Australia.—On account of the outbreak of rinderpest in Western Australia, and to guard against the danger of its introduction into New Zealand, the importation of sheep, swine, or fodder from New South Wales, Victoria, or South Australia was, by an amendment to the Regulations under the Stock Act gazetted last month, prohibited, except with the precedent consent of the Minister of Agriculture. All stock are already prohibited entry into New Zealand from the States of Queensland and Western Australia, and as cattle have been absolutely prohibited from the other States of the Commonwealth, except Tasmania, for some years past, the effect of the amendment is to make it unlawful for any classes of stock mentioned in it to be introduced from the States of New South Wales, Victoria, and South Australia without previous permission, an embargo being on the other States and the absolute prohibition remaining on cattle from all States.

From the United Kingdom.—On account of continued outbreaks of foot-and-mouth disease in Britain a regulation under the Stock Act was also gazetted last month prohibiting the introduction of cattle, sheep, and swine, and fodder for live-stock, from the United Kingdom. This regulation does not apply to live-stock shipped before the date of its coming into operation—namely, 10th January, 1924.

Rabbit-poisoning with Strychnine.—In the article on this subject published in last month's *Journal* (page 32) the headline "Strychnine and Sugar Paste" was inadvertently misplaced. It should have headed the succeeding paragraph commencing with the words "The mode of preparing the poison"

SEASONAL NOTES.

THE FARM.

CULTURAL WORK.

THE exceptionally early completion of harvesting operations this season affords an excellent opportunity for the preparation of the soil for early autumn-sown crops, and, since good cultivation is the first essential in crop-production, one may look forward to crops getting at least a good seed-bed if full advantage is taken of the occasion.

The importance of preparatory skim-ploughing can hardly be too highly stressed. Skimming, followed by breaking-down, enables the establishment of a good tilth to the full depth of the subsequent deep ploughing. Many farmers are inclined to view the extra ploughing as being not worth while, but if it is remembered that the difference between a good tilth and a bad one may mean a difference of, say, several bushels in grain yield, it can be easily realized that any additional work is justified and pays for itself handsomely. Again, it is easier to cultivate lightly ploughed land than that which is deeply ploughed, and the minimum of work is necessary in breaking-down the deep ploughing which follows well-cultivated skimming. If the ground is inclined to be twitchy a single deep ploughing and subsequent cultivation will not suffice to provide the desirable uniform tilth. So much work is required in the attempt to compact the soil and provide a continuity of soil-particles from below upward that even though the surface is worked down to a very fine state air-spaces will still occur below—a most undesirable condition. In dirty or stiff lands practically no implement can work satisfactorily to the full depth of the deep furrow. It is therefore good practice to skim and work on the skimming at intervals until the ground is required for deep ploughing preparatory to sowing crops.

Where a winter fallow is intended ploughing should be done at a fair depth on the heavier soils. In order that a rough surface may be exposed to the ameliorating effect of winter weather the plough should be set so that the furrow slice is turned as much as possible on edge.

GREEN CROPS.

The sowing of green crops as suggested in last month's notes should be pushed forward. March is usually a good month in which to sow oats and tares or similar crops for early spring feeding—letting them run on later for ensilage or hay crops. For average conditions Algerian oats, 2 bushels, and winter tares, 1 bushel, or wheat, 2 bushels, and tares, 1 bushel, are suitable mixtures. Basic super, or mixtures of half super and half Nauru phosphate or basic slag, 1 cwt. to 2 cwt. per acre, are suitable manures. Peas are at times used instead of tares, but they do not stand the feeding and the winter well. All land that has grown soft turnips or other forages and is not to be put down in pasture should be sown in one or other of these catch-crops, so as to keep the land clean and provide early feed.

In the North late February and March are favourite months for sowing turnips, whether they are being grown on new ground that has been fallowed during the summer or in succession to millet or oats. Red Paragon or Devonshire Greystone mature quickly for early feeding, and Green-top are good late turnips. Swedes are good keepers, but are a bit chancy if sown after the end of February. In addition to roots, spring feed may be provided by sowing a quick-growing mixture of Italian rye-grass, Western Wolths rye-grass, and red clover or crimson clover, according to local conditions. Oats, either with or without rye-grass, are favoured in some districts.

For South Otago and Southland conditions, a mixture of Western Wolths rye-grass, 30 lb., and red clover, 4 lb., will provide early feed, and should suit those farmers who intend using the same area for late sowings of turnips next season. A mixture of Dun oats, $2\frac{1}{2}$ bushels, and tares, $1\frac{1}{2}$ bushels, also makes good early feed. Where economic reasons demand the autumn-sowing of grass along with the crop then tares should be omitted, the oats and grass being sown in conjunction. Another crop well worthy of trial is Cape barley.

In Canterbury and North Otago Italian rye-grass or Western Wolths may be sown with advantage in March, and with favourable weather a good growth of very early spring feed should be assured—in fact, on good land there is every likelihood of late autumn grazing. A seeding of 30 lb. per acre is generally sufficient, and if from $\frac{1}{2}$ lb. to 1 lb. of rape is sown with the rye-grass, a certain amount of autumn feed is practically certain.

AUTUMN-SOWING OF PASTURES.

The subject of autumn grassing was dealt with in last month's notes, and this work should be pushed along in March so as to give the young plants, particularly clovers, time to establish before cold weather sets in. When land is being prepared for permanent pasture great care should be taken to see that the soil is in a good state of fertility and that a good seed-bed is prepared. If the land has been cropped out it is much the wisest plan to put it in a temporary pasture and allow it to build up for a year or two before sowing the expensive permanent mixture. Having decided to put in a permanent pasture, the next thing is to select a good mixture and obtain first-class seed. In selecting the mixture the farmer must be guided by his soil, situation of the land, geographical position, and other conditions which vary practically with every farm. It is not feasible in these brief notes to specify individual mixtures, but those concerned are referred to an article by E. Bruce Levy in the *Journal* for May last, detailing a large number of such mixtures for various soils and conditions. Mr. Levy's series of *Journal* articles on the principles of pasture-establishment have been reprinted and published as Bulletin No. 107 (price 1s.), which is obtainable from the Department of Agriculture, Wellington.

On arable land subject to bad infestation of annual weeds, autumn is undoubtedly the best time to sow any form of pasture. The application of some readily available phosphate, such as superphosphate, Ephos, or basic super. when sowing is strongly recommended.

LUCERNE.

Young crops should be ready for cutting for the second time during March. When this cut has been removed the land should be given a few strokes of the tine harrow or a light cultivator to loosen the soil and bring away a vigorous growth before cold weather sets in. If this cultivation is properly carried out it will save much spring work.

March is also a good month for cleaning up established stands that have been neglected, as the weather is usually dry enough to destroy most of the grass and weeds without injuring the lucerne. If the ground is hard and the grass in fairly large clumps good results can be obtained in districts with ample average rainfall by giving one or two cuts of the disk, followed by a cultivator or tine harrow. When using the disks care must be taken to see that they are set as straight as possible. The object is for the disk to break up the surface and large clumps of grass, and the cultivator or harrows can then shake up the land to a proper depth. It is sometimes stated that the use of the disk is harmful, but under the conditions outlined it is a most useful renovator. Some of the best stands in South Taranaki have been disked once a year for a number of years past. Established stands that are free from weeds and in good condition are best left alone.

Stands that are thin and have much bare ground may after this autumn cultivation be sown with a few pounds of Italian rye-grass, or a bushel to a bushel and a half of oats. This will provide early spring feed and occupy the land which would otherwise be growing weeds.

Established stands may be grazed from now until the end of the growing season. Young areas should be allowed to stand through the winter with a fair growth on them.

THE MAIN POTATO-CROP.

The lifting of the main crop should be general in March. Potatoes should never be harvested while the soil is wet, but should turn out clean and free, and if stored in this condition they keep much better. If emptied into a spare shed or room excessive light must be prevented from entering, as they green very quickly, and this spoils them for table use. On the other hand, if they are required for seed-purposes light is advantageous.

In the colder districts the usual method is to pit the tubers in the open by piling them in long heaps—say, a base of 5 ft. or 6 ft. brought up to a point at a height of $2\frac{1}{2}$ ft. to 3 ft.—with the heap any length required. Cover with a good layer of dry clean straw, and again cover with a thick layer of soil brought to a fairly sharp finish at the ridge, the whole being nicely patted smooth with a spade. Ventilators should be made by inserting a few tile drain-pipes along the ridge, or else good wisps of straw, otherwise undue heat may develop and decay set in. Another good method where frosts are not heavy is to tip the tubers in long heaps under a shady plantation or belt of trees (preferably pines or the like) and cover well with straw. In this way they will usually keep very well, and as

ventilation and temperature are good there is little danger of decay. Care must be taken that no diseased tubers are included with those stored for winter.

IRRIGATED LANDS.

Farmers practising irrigation should make provision to carry out the final watering of their land in March, as the supply of water from the races is cut off at the end of the month. This especially applies to the soaking with water of uncultivated ground intended to be broken up during the winter. There is no doubt that by this means ploughing is made easier and more satisfactory. A start should be made to break up new land, and this operation not left until the winter, when, in all probability, the ground will be frozen so hard that ploughing will prove out of the question. This note, of course, has special reference to Central Otago.

FEEDING OF FORAGES.

Early-fed rape will still be providing a fair growth during March, and, like other green fodders if they can be spared, will help to freshen the ewes just before tupping. Soft turnips will be proving useful to the dairymen now, and any surplus of early crops not required can be fed off with sheep.

Maize should be fed with the intention of utilizing it all by the middle of April, as at any time after that frost may occur. Should there apparently be a surplus in view it would be wise to consider making ensilage of this early in April.

Many early-sown green catch-crops will now be making good progress. Barleys should not be allowed to get away, but be fed off in good time to prevent the tendency which this cereal has at this time of the year of shooting into ear.

SUNDRY HINTS.

Grain should be got off the land as soon as possible after threshing. If this is done before the wet weather sets in a good deal of damage to the paddocks and additional work in handling is saved.

If shelter stacks in horse-paddocks are not already provided advantage should be taken at stack-threshing to cart at least one good-sized stack into the paddock where horses are to be wintered. This will provide a picking at nights, as well as shelter, and lend to the general welfare of the teams.

Care should be taken before clover is cut for seed to examine the heads carefully. Often what appears to be a likely paddock for seed has little else but dummy heads in it. The heads from various portions of the paddock may be rubbed out in the hand for this purpose. Good cow-grass seed when mature should show a purplish colour.

March is a good time for cleaning out dams and creeks that are relied upon for water-supply, as well as ditches the main function of which is drainage.

—*Fields Division.*

THE ORCHARD.

THE main orchard harvest is at peak during March. The leading export varieties of apples and many others intended for local markets, also pears, will require to be dealt with. Only the very strictest attention to details, concentration on the work, and a constant amount of hard labour will lead to successful results.

EXPORT POINTS.

With present overseas market prospects every effort will no doubt be made to ship apples of exportable quality. Conditions of the Government guarantee and modifications of the export regulations for the 1924 season have been published, and should be carefully perused by all exporters. Much might be said in general about selection and preparation of fruit for export, but specific local information should be sought from the district Orchard Instructor. Attention may, however, be directed to some of the general outstanding points which may best be dealt with by a caution, as follows:—

Don't pick immature fruit; don't overfill orchard boxes; don't expose picked fruit to the sun; don't handle fruit unnecessarily; don't fail to discard rejects as picked; don't use cases that are faulty; don't use nails of less than 14 gauge or $1\frac{1}{2}$ in. long; don't sacrifice the pack for speed; don't use wrong-size paper, but consult the list; don't forget to mark cases correctly; don't use other than the universal label; don't use oversize lids; don't allow wood-wool to protrude from ends of lids; don't place the wire more than 1 in. from the end of case; don't allow the wire tie on the corners; don't allow fag ends to wires, but cut well up to the tie; don't overload a conveyance until the springs are useless.

FRUIT FOR LOCAL MARKET.

The local-market varieties suitable for cool storage should receive every consideration, prompt handling into store being the first essential towards success. Much of the fruit found unsuitable for export may also be more profitably dealt with later if placed in store meanwhile. Of course, it never pays to rehandle any fruit which was very low in grade; such rejects should be cleared away as soon as possible by feeding to stock, but there is a grade perhaps not quite up to export standard which may be found quite suitable for some classes of trade on the local markets.

SPRAYING WORK.

Orchard-work proper for March will consist of spraying late varieties of apples and pears with arsenate of lead for codlin-moth and leaf-roller, with the addition of lime-sulphur for red-mite and black-spot or bordeaux instead of lime-sulphur if black-spot is bad. These late coatings of a fungicide are very essential for fruits which are to be later held in an orchard air-cooled store, because they have a restraining influence on the development of fungus troubles under storage. Apple-trees from which the fruit has been picked, if infected with woolly aphis, should be sprayed with oil, 1-60, to deal with the autumn brood of aphis.

Late stone-fruits should be sprayed with lime-sulphur, 1-125, plus 8 pound of atomic sulphur, for brown-rot, &c. Trees from which the fruit has been picked are better sprayed at this period with bordeaux, 3-4-40.

CULTIVATION AND COVER-CROPS.

Where cultivation has been suspended, and the weeds have got ahead, the mower may be used to prevent weeds seeding and make it possible to get about the orchard with greater comfort and efficiency. Where the cultivation has been continuous, or the land can be turned up, early March is a very suitable time for sowing green crops to be turned in next spring. Peas, oats, vetches, and horse-beans are all suitable for sowing, according to locality.

—*W. H. Rice, Orchard Instructor, Hastings.*

CITRUS-CULTURE.

Where citrus-fruits are grown in mixed orchards there will be little time during March to give them much attention, as the most urgent work of marketing other fruit will be on hand. However, there will be no work that requires urgent attention in the citrus-groves beyond the maintenance of thorough cultivation and the harvesting of any fruits yet remaining.

FIREBLIGHT.

The position regarding fireblight in the Auckland District, especially in the commercial fruitgrowing areas as proclaimed under the Fire-blight Act, 1922, may be considered very satisfactory at the present time. Some infection has occurred in the northern part of the district, in localities which are not included in the prescribed commercial areas. A sharp lookout should be kept by all growers, with a view to the immediate identification, removal, and destruction by burning of all infected parts, or infections bearing a suspicious appearance. Although the position is satisfactory so far, it is yet possible, should weather conditions remain favourable to its spread, that further tip-infection may occur, and therefore vigilance should not be relaxed at this period.

—*J. W. Collard, Orchard Instructor, Auckland.*

POULTRY-KEEPING.

CLASSIFYING AND CULLING THE STOCK.

MARCH is the best period of the year for going through the stock for the purpose of weeding out all birds that have passed their most profitable period of production, and also to select the best specimens for future breeding-purposes. It is then, or just before the moulting process commences, that certain signs manifest themselves indicating whether a bird has in the past year been a heavy producer or whether it is likely to be so during the next. In a general way these signs vanish as soon as the birds have moulted. There should thus be no delay in carrying out this important work.

In classifying the stock three grades should be made—namely, future breeding specimens, birds which show indications that they will pay to keep another year, and the culls. The latter should be the first to remove from the flock. There must be no sentiment allowed to enter into this matter. If the maximum return is to be made from poultry no birds (except noted breeding specimens) should be kept beyond the second laying season. One of the great weaknesses, especially on farms, at the present time is that too many birds are kept till they have long passed their stage of usefulness and for years have been practically eating off their heads, being allowed, as a matter of fact, to die of old age. The farmer would not think of continuing to milk a cow that was hardly giving enough milk to rear a calf, or of using an old horse that could not do a decent day's work, but too often he will allow any number of old hens to mope around which are not even paying for their board.

In order to simplify the work of culling, all young birds should be marked in the web of the foot by a special punch made for the purpose. In this way, and by keeping a correct register of such marks, the different ages can be ascertained at a glance and the old birds weeded out at will. This must not be held to imply that it will pay to keep all birds till the termination of their second laying season. In all flocks of one-year birds, no matter how well they may be bred or fed, individuals are to be found that will not pay to keep for the second year.

SELECTING THE LATE MOULTERS.

It is now generally recognized that lateness of moulting is one of the best guides to heavy productive power, but this only applies where the birds are of about the same age and the management received has been uniform in all respects. For example, in a mixed flock of first and second season's layers it will be usually found that the former will moult first. Especially is this the case where the older birds were selected the previous season as late moulters. Then again, where a flock has recently been subjected to violent changes of food or change of quarters the good layer is apt to moult early, as is the case with the poor layer. It will thus be seen that local conditions should always be taken into consideration when classing stock according to their time of moulting.

General appearance: This, apart from the question of the time of moulting, gives a good guide in determining a bird's productive power. The heavy layers will present a more or less shabby appearance, and owing to this fact are often the first to be culled out by the inexperienced poultry-keeper. In white-coloured breeds the plumage will usually be more of a straw colour than a white, while in the case of black birds the feathers surrounding the thighs and abdomen will bear a more or less rusty appearance. Birds with a well-kept, glossy plumage, and which are usually well above the ordinary weight of their breed at this period of the year, are flesh-makers, and should therefore be culled out. The good layer is always tight and thickly feathered. Not only does loose feathering denote poor laying-capacity but an impaired constitution as well.

Head points: The head of a bird is a good guide in the selection of stock. The good layer will show a clear face free from wrinkles

and feathers. Indeed, with the exceptionally heavy layer it is not uncommon for the head to become completely devoid of feathers towards the termination of her laying season. Of course these are always renewed at moulting-time. The eye of the heavy producer is round and prominent, and presents a fiery expression. In short, the head should be neat but moderately deep and broad, with a stout well-curved beak. Birds with coarse heads, long thin beaks, heavy feathered eyebrows, dull sunken eyes, and wrinkled skin surrounding the eye, mostly indicate poor egg-capacity and low vitality.

The pelvic bones: While the width of these gives no guide to productive power, their condition will serve as a guide to the novice in the work of culling. When a bird commences to lay these bones expand to a more or less greater degree, but when the bird is about to take a rest they contract. Thus, with say, a two-year-old bird it is intended to cull at the end of the present laying season, and where the bones are found close together, it may be safely assumed that it is not laying or likely to in the near future, and it can be weeded out accordingly.

The abdomen: The condition surrounding the abdomen gives probably the best guide of all to laying-capacity. In the good bird it will be found full, pliable, and soft to the touch. Of course, the abdomen is not the egg-basket, but the development of the egg-cluster or ovary, which is situated much higher up, causes the intestines to fall, and consequently a fullness of the abdominal region occurs. Therefore when the abdomen appears to be full and is soft to the touch it may be taken for granted that the egg-cluster is in an active stage of development, and that the bird is either laying or on the point of it. On the other hand, the abdomen of the low producer will be found more or less shrunken, besides being thick and hard to the touch.

SELECTING THE BREEDING-BIRDS.

Having removed all the culls from the flock, the next important step is to choose the prospective breeders. In this connection I cannot emphasize too strongly that the best layer is not necessarily the best breeder. The danger of improving one character by weakening another should always be kept in mind. In addition to possessing a maximum of laying-points the ideal breeding-bird should be at least a fair specimen of the breed it represents. In other words, it should conform to breed-type. If a heavy-producing strain is to be built up or maintained it is imperative that the breeder shall have an ideal type to aim for pictured in his eye. Egg-record alone will never achieve this end. Above all, only birds which conform to standard weight requirements, and those which lay a decent-sized marketable egg, should be bred from.

For a bird to produce desirable progeny for the maintenance of a heavy-laying strain it is essential for it to have some "timber" about it. Not only should the back be broad, but there should be a great depth of body, well developed in front and in the abdominal region. The small-egg question is becoming a serious matter, especially in view of the fact that nothing under a 2 oz. product is suitable for the export trade. There is no better way of raising the standard of eggs

than by eliminating from the breeding-pens diminutive specimens of a breed. These latter, by the way, are too often bred from throughout the Dominion to-day.

In the case of novices and those who have not had much experience in the selection of breeding-stock, I would advise them, if they have not already done so, to obtain a copy of the New Zealand Utility-poultry Standards. This booklet is obtainable from the Department of Agriculture, Wellington, at a cost of 3s. The illustrations contained therein of the ideal types of the various breeds will serve as a guide in selecting the most desired class of bird to breed from for the production of a uniform flock.

MANAGEMENT OF THE BREEDING-BIRDS.

After selecting the most desirable specimens for future breeding-purposes the birds should be carefully marked and kept by themselves. This is in order that they may be specially attended to. The food to be provided at this stage is most important. On no account should the birds be forced for egg-production. On the contrary, an endeavour should be made to retard egg-production by providing a plain ration or by frequent changes of diet. This will induce the birds to moult and give them an opportunity to recoup. True, there will be a loss of eggs just at a time when the price of the latter is advancing; but any loss in this way will be easily made up by the fact that they will commence their next laying-season much earlier and when eggs from adult stock are most desired for the production of early chickens. Too many poultry-keepers depend on pullet-eggs for the production of early chickens, owing to the adult birds not coming on to lay at the desired time. This is a weak practice, and if continued from generation to generation it is more than probable that the stock will decline in size and constitutional vigour and be layers of second-grade eggs.

—F. C. Brown, *Chief Poultry Instructor.*

THE APIARY.

FINAL EXTRACTING.

BEFORE taking the last of the surplus honey a careful examination of the colonies must be made in order to ascertain the amount of stores available for wintering the bees. Too often beekeepers err in extracting too closely, and feeding has to be resorted to at a later period to make up the amount required to prevent starvation. It takes 30 lb. of honey to winter a colony successfully, and if this amount is increased to 40 lb. there is less likelihood of the bees being short in the spring, while the beekeeper will also be saved a great deal of anxiety and endless trouble in the way of feeding.

Where extracting has been delayed for any reason it is advisable to use great caution in removing the honey. The combs should be removed as expeditiously as possible, and care must be exercised not to incite the bees to rob by keeping the hives open longer than it is necessary to remove the surplus. A hasty examination of the brood-chamber should be made if it is found that the bees have not filled the

combs in the lower story with honey. If empty or partly filled combs are found it is highly important that they be replaced with good combs of honey from the super. On no account attempt to extract any honey from the brood-chamber. Do not leave combs lying about or expose vessels that have contained honey. Unless caution is exercised in regard to these details, when the final extracting is being done the beekeeper is more than likely to start the bees robbing in a wholesale manner.

BEE-ESCAPES.

For removing honey late in the season the beekeeper may find it necessary to bring into use bee-escapes. These escapes enable the honey to be removed without causing any disturbance. By the employment of the Porter bee-escape there is less likelihood of causing robbing, with its attendant evils. More especially will the escapes be found advantageous when removing section honey from the hive. There is far more risk in removing comb-honey from the hive than extracted honey. When the colony is disturbed the bees will at once start to fill their sacs, and often the cappings of the sections are punctured in order to secure a supply of honey. The damage to the cappings of sections is unsightly, and causes the honey to leak after removal from the hive. The escapes are fitted to a board of the exact dimensions of the hive in use. In inserting the board gently prize up the super from the brood-chamber and insert the board. A puff of smoke will suffice to control the bees while the operation is being performed. If this is done late in the afternoon the bees will pass through the escape during the night to the brood-nest, and will be unable to return. In the morning the supers may be removed, when practically no bees will be left in the super.

A word of caution to those who have not formerly used the escapes: Should there be brood in the super-combs the bees will not leave, and the escapes will not prove effective in ridding the supers. Over and over again many beginners complain that they cannot get the bees to leave the supers when using escapes, but the reason lies in the fact that no examination had been made to ascertain beforehand whether the super contained honey only.

UNITING COLONIES.

Among the autumn work to be attended to is the examination of the colonies for the purpose of ascertaining if each possesses a laying queen, and to note those that are too weak to survive the winter. In the negative in either case it is advisable to unite with a stronger colony to save the bees. On no account should an attempt be made to winter weak hives, as they are likely to get robbed out, and this may cause the bees to start robbing when everything in the apiary should be quiet. A simple method of uniting may be practised by placing the weaker hive on top of a stronger one, and placing a sheet of newspaper between the two hive-bodies. In the course of a few days the bees of the weaker colony will gain their way through the paper and unite peaceably with the bees in the stronger hive. The surplus combs may subsequently be removed and reserved for spring feeding if required. It is advantageous to destroy the queen in the weak hive prior to uniting.

ROBBING.

At the close of the honey-flow the beekeeper must persistently guard against robbing. Robbing is the result of carelessness, and once it has started is exceedingly hard to check. As previously mentioned, neither honey, sugar-syrup, nor anything that the bees can rob should be exposed. In case wet combs have to be returned to the hives for the bees to clean up, postpone this operation until late in the day, when robbing is not likely to start. See that the honey-house is bee-proof, and that all combs and vessels containing honey are removed to a place of safety. Contract all hive-entrances, and especially guard against hives being open in a way that they can be attacked by robbers. All operations must be carried out quickly. If robbing has started it is better to postpone all outside work until the apiary is quiet again than to risk extending the trouble by opening the hives. Should a colony be attacked, contract the entrance and pile wet grass in front of the hive. This will usually cure mild cases of robbing, but where a colony has been overpowered by the robbers it should be closed altogether.

—E. A. Earp, *Senior Apiary Instructor.*

THE GARDEN.

VEGETABLE-CULTURE.

After the dry summer, winter crops (cabbage, broccoli, celery, &c.) are probably a little backward, and would benefit from a second light dressing of nitrate of soda. Hoe between the rows on bright dry days to keep the weeds down. The celery must not be allowed to suffer from want of water. Allow the plants to make almost full growth before earthing up, and for this operation choose a fine day when the soil and plants are dry. Keep the soil from the hearts of the plants, and do not pack the soil too tight.

Harvest crops as they reach maturity. Cut pumpkins before the rind gets too hard, and allow them to remain for a few days where they grew; then store them in a dry airy place.

Clean up and burn all litter as it accumulates. Some growers pull their tomato-plants when finished and leave them on the sticks or strings to dry before they are gathered and burnt—a very good practice. Land that is not going to be cropped immediately is best sown down with a cover-crop. White mustard, oats and vetches, or oats and horse-beans are often used with good results.

Glasshouses in which a tomato crop affected with rust or mildew has been grown should be well sprayed with a fungicide before sowing down. Even the “strings” might well come under suspicion and receive attention. Give ample ventilation at this season.

Sow turnips and spinach for winter use, also lettuce and cabbage for early spring cutting, and towards the end of March sow cauliflower seed.

SMALL-FRUIT.

Preparation of the land for new plantings should now be proceeded with ; success depends on initial preparation more than on any other factor. Harrow, cross-plough, and subsoil, thus ensuring a deep clean tilth, incorporating also a generous application of manures. In the absence of the usual organic manures a good application of bonedust and potash will usually meet the case. If the surface is at all lumpy or uneven use a clod-crusher ; besides breaking the clods it will smooth the surface and facilitate planting.

Where the intended crop is strawberries secure the plants as early as possible—probably towards the end of March—and plant them without delay, so as to get them well established before the winter. Plant ordinary varieties 12 in. to 16 in. apart, with 24 in. to 30 in. between the rows—planting them firmly.

Carefully look over brakes of gooseberries, currants, or raspberries ; although the crop is gathered they require close attention so that the buds may set well for next year. Too often the foliage drops prematurely through disease, or from the same cause becomes shabby and discoloured. Clean and well-coloured foliage is required up to the end of the season to set the buds well and ensure a satisfactory crop next year. Where rusts or anthracnose, borers, or bud-moth are troublesome one or two applications of bordeaux with arsenate of lead (summer strength) would be of great advantage. In the case of raspberries remove and burn the old canes first.

FLOWERS AND LAWNS.

Autumn rains falling on soil heated by the summer sun soon quicken growth in most kinds of vegetation. Lawns will require more frequent cutting to keep them short and of good colour ; bare spots may be raked up and sown with seed, and top-dressed with fine soil. A thin turf will be much improved by a dressing of basic slag or other good fertilizer applied now. Where new lawns are to be laid the surface should be graded to drain water away from the house. Rake the surface smooth and fine and make it firm by rolling. Another stroke of the rake will be required before broadcasting the seed, of which from 5 lb. to 6 lb. will be required for 200 square yards. A further stroke of the rake will complete the job.

Seedling flowering-plants raised from seeds sown last month will require to be thinned or pricked out into beds or boxes of rich soil, with a view to obtaining good strong plants for putting out into permanent quarters towards the end of March.

That period is also a good time to make alterations in the herbaceous sections. Old clumps may be lifted, trimmed back, and broken up and replanted. Before planting give the land thorough preparation—manuring, and trenching if possible. The arrangement and grouping of these plants affords opportunity for the exercise of taste. Rather large grouping in the vicinity of shrubs and trees can be made very effective.

Complete the planting of spring flowering bulbs as soon as possible.

—William C. Hyde, *Horticulture Division.*

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

LIVE AND DEAD WEIGHT OF SHEEP AND LAMBS.

"STOCK," Kelso :—

Would you please let me know the difference between live weight and freezing-weight of lambs and wethers ?

The Live-stock Division :—

From practical tests it has been ascertained that the difference between live and dead weight and freezing-weight varies slightly, but usually runs somewhere about 50 to 55 per cent. In a test at a freezing-works in Canterbury some few years ago ten average sheep and ten average lambs were killed, with the following results : The average live weight of the sheep was 109½ lb.; the dressed weight warm was 56½ lb., the dressed weight cold 55½ lb., and the freezing-weight 53½ lb. The percentage of dead to live weight was—warm, 51·4; cold, 50·5; and frozen 48·2. The average live weight of the lambs was 67½ lb.; the dressed weight warm, 36½ lb.; the dressed weight cold, 36½ lb.; and the frozen weight 34½ lb.

LAYING DOWN A LAWN.

A. H. FLAY, Te Awamutu :—

Will you please give me information regarding the laying-down of a lawn on ordinary loam soil of the Waikato? I should like to know how to prepare the soil, the best grasses to use, and the manure requirements.

The Horticulture Division :—

Growing a crop of potatoes is an excellent preparation for the ground before laying down a lawn, the necessary cultivation breaking up and sweetening the soil. Care should be taken, however, to leave as few of the tubers as possible in the ground, as they break up and disturb the young grass. The area should now be dug over and levelled as nearly as possible. It should then be well rolled; this will crush lumps and show hollows. The surface should then be raked over, the hollows being filled as the work proceeds. Roll again, and if the surface is free of lumps it will be ready for the seed. If there still are lumps these must be broken up, first by raking with a sharp rake, then rolling again. Allow ½ oz. of seed for each square yard. Scatter the seed evenly and lightly rake it in, then roll again. If the soil is at all clayey the last rolling should be left until the grass is up. Suitable grasses are *Poa pratensis*, fine-leaved sheep's fescue, and crested dogstail, used in equal proportions. A dressing of basic slag, 4 cwt. to 6 cwt. per acre, may be given before sowing. The best time to sow is during the month of March, to ensure a good sward being secured before winter sets in.

CONTROL OF BLACKBERRY.

"SUBSCRIBER," Waihi :—

Will you please inform me as to the best way to cope with the blackberry pest ?

The Live-stock Division :—

The method that can be most advantageously applied will depend to a great extent upon the condition of the land on which the weed is growing. Cultivation of the infested land is easily the most effective method of eradication where it can be applied, and in the long-run it is also the cheapest method. Where an area of blackberry-infested land is broken up it should be kept under cultivation with suitable crops until the whole of the roots are removed. On land which

cannot be cultivated blackberry may be kept under control by any of the following methods: (1) Cutting followed by burning; (2) spraying with a weed-destroying preparation; and (3) stocking with goats. When cutting is adopted the best results are obtained by doing the work after the fruit forms, provided, of course, that the latter is not permitted to ripen. If a fire can be put through the blackberry about six weeks after it has been cut, the result will be much more permanent, as the burning of the young shoots at that time is very weakening to the plants. Spraying with a weed-destroying preparation is often resorted to as a means of killing the vegetation so that the weeds may be burned. If adopted as a means of eradication spraying must be carried out at intervals sufficient to prevent young shoots from making leaf. The best time to commence spraying is when the plants are in flower. When goats are used as a means of control secure fences are necessary, in order both to keep them on the infested areas and to avoid trouble with neighbours.

COWS RETURNING TO BULL.

N. B., Motueka :—

We have several cows that have returned to the bull, some as many as four times. These cows have been washed out each time, and two have returned after holding for six weeks. We also have several cows we are not putting to the bull, and have noticed that about three or four days after being on heat there is a fair amount of blood discharged from the vagina, both from the cows that have been to the bull and the ones that have not. Will you kindly advise in the matter?

The Live-stock Division :—

Both after contagious abortion and in catarrhal vaginitis this continual "coming back" is a constant occurrence. As you do not mention having had abortion in your herd, the probability is that contagious vaginitis is present. An examination of the vaginal passages should be made—first in those affected, and then, after thoroughly cleansing the hands, of those apparently sound. If affected, the passages have a red, angry appearance, and on the surface are small elevations which are quite appreciable to the finger. Usually, owing to the irritable condition, the animals do not appreciate handling. Frequently there is a discharge accompanying the trouble, and there may be some ulceration. The "bulling" in many cases is not true bulling, being due to the irritation set up, and many cows which have apparently come back may be actually in calf. An article on vaginitis in cows was published in the April, 1923, *Journal*, and reference to it would give you further useful information.

IMPORTATION OF FERTILIZERS: DECEMBER QUARTER.

FOLLOWING are the importations of fertilizers into New Zealand for the quarter ended 31st December, 1923: *Sulphate of Ammonia*: United Kingdom, 25 tons; Australia, 83 tons: total, 108 tons. *Gypsum*: Australia, 800 tons. *Nitrate of soda*: Chile, 450 tons. *Basic Slag and Thomas Phosphate*: United Kingdom, 100 tons; Belgium, 750 tons; France, 25 tons: total, 875 tons. *Bonedust*: India, 525 tons; Australia, 840 tons: total, 1,365 tons. *Guano and Rock Phosphate*: United Kingdom, 20 tons; New Caledonia, 2,881 tons; Ocean Island, 6,900 tons; Makatea Island, 9,766 tons; Nauru Island, 6,330 tons: total, 25,897 tons. *Phosphates, other*: Egypt, 2,196 tons. *Kainit*: United Kingdom, 150 tons; France, 260 tons; Germany, 285 tons: total, 695 tons. *Sulphate of Potash*: United Kingdom, 15 tons; France, 20 tons; Germany, 25 tons: total, 60 tons. *Potash, other*: France, 5 tons; Germany, 5 tons: total, 10 tons. *Sulphate of Iron*: United Kingdom, 5 tons; Australia, 13 tons: total, 18 tons. *Manures, other*: United Kingdom, 1 ton.

Apple-packing Standards for Local Market.—The apples of Commercial A grade are to be packed not less than 200 to the bushel case—not 220 as printed on page 70 of last month's *Journal*.

WEATHER RECORDS: JANUARY, 1924.

Dominion Meteorological Office.

GENERAL SUMMARY.

THE weather in January, though warm and dry on the whole, was marked by distinctive changes. The troughs of at least five low-pressure areas passed in the South from the 1st to the 15th, and until the 13th the weather was very warm, muggy, and wet in the west coast districts, but hot and dry in the east-coast districts. There was a cold snap for a few days about the middle of the month, but a more easterly and summery type of weather followed. This prevailed until toward the close of the month, when a moderate westerly disturbance made its appearance in the South.

The rainfall was above the average at most stations along the western coast and the higher levels of the South. Kaitaia, in the far North, had percentages of 125, Arthur's Pass, 225 and Queenstown 152 above the mean January rainfall: and Lake Wakatipu was much above flood-level for several days.

In the east coast districts the dry conditions which had been prevalent mostly since the middle of October caused considerable trouble until the middle of the month, when a bountiful rainfall was reported in most parts of the country, and showers were also experienced later. In most parts of the east coast the total rainfall, however, was from 30 to 50 per cent. below the mean January fall.

High westerly winds were experienced, especially about the 13th, 14th, and 15th, when considerable damage was done to orchards.

—D. C. Bates, Director.

RAINFALL FOR JANUARY, 1924, AT REPRESENTATIVE STATIONS.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average January Rainfall.
<i>North Island.</i>				
	Inches.		Inches.	Inches.
Kaitaia	7.85	9	3.75	3.30
Russell	2.82	11	1.12	4.54
Whangarei	2.88	16	0.74	3.63
Auckland	3.85	13	2.37	2.59
Hamilton	2.45	13	1.10	3.70
Kawhia	1.89	9	0.45	3.37
New Plymouth	3.84	11	0.88	4.32
Inglewood	7.98	13	2.32	7.43
Whangamomona	5.85	17	0.87	5.82
Tairua, Thames	2.02	7	0.90	4.12
Tauranga	2.77	18	1.12	4.40
Maraehako, Opotiki	4.80	8	2.62	2.87
Gisborne	3.43	11	1.34	2.77
Taupo	3.18	13	0.82	3.46
Napier	1.67	8	0.56	2.44
Maraekakaho, Hastings	1.23	8	0.47	2.39
Taihape	2.52	13	0.78	3.03
Masterton	1.67	10	0.50	2.62
Patea	4.63	10	0.98	3.38
Wanganui	1.90	6	0.74	2.84
Foxton	1.92	8	0.68	1.99
Wellington	2.24	12	0.48	3.32
<i>South Island.</i>				
Westport	7.93	19	1.50	6.80
Greymouth	12.79	19	2.18	9.04
Hokitika	16.72	20	2.74	9.87

RAINFALL FOR JANUARY, 1924—continued.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average January Rainfall.
<i>South Island—continued.</i>				
	Inches.		Inches.	Inches.
Arthur's Pass	23·94	15	4·63	6·75
Okuru, Westland	17·80	16	2·88	12·86
Collingwood	5·48	8	2·66	6·95
Nelson	1·43	8	0·46	2·71
Spring Creek, Blenheim	0·55	5	0·23	2·22
Tophouse	4·39	10	0·77	5·16
Hanmer Springs	4·52	11	1·53	3·30
Highfield, Waiau	3·00	5	1·22	2·84
Gore Bay	4·07	7	2·02	2·47
Christchurch	1·92	10	1·19	2·15
Timaru	0·84	8	0·42	2·28
Lambrook, Fairlie	2·44	7	0·86	2·34
Benmore, Omarama	2·94	11	0·60	2·66
Oamaru	1·36	6	0·85	2·15
Queenstown	6·83	14	1·24	2·71
Clyde	3·22	10	1·06	1·72
Dunedin	2·49	12	0·80	3·41
Gore	2·51	12	0·84	3·34
Invercargill	4·30	14	1·10	4·14

FORTHCOMING AGRICULTURAL SHOWS.

Franklin A. and P. Society: Pukekohe, 22nd and 23rd February.
 Rotorua A. and P. Association: Rotorua, 27th February.
 Opotiki A. and P. Association: Opotiki, 27th February.
 Tauranga A. and P. Association: Tauranga, 28th February.
 Waipu Agricultural Association: Waipu, 28th February.
 Omaha and Pakiri A. and H. Society: Leigh, 1st March.
 Taumarunui A. and P. Association: Taumarunui, 5th March.
 Taranaki Metropolitan Agricultural Society: New Plymouth, 5th and 6th March.
 Waikato Central Agricultural Association: Cambridge, 5th and 6th March.
 Mangonui County A. and P. Association: Kaitaia, 8th March.
 Morrinsville A., P., and H. Society: Morrinsville, 12th March.
 King Country Central A. and P. Association: Te Kuiti, 13th March.
 Hawke's Bay A. and P. Society: Hastings, 18th and 19th March.
 Mayfield A. and P. Association: Mayfield, 22nd March.
 Methven A. and P. Association: Methven, 27th March.
 Temuka and Geraldine A. and P. Association: Winchester, 3rd April.
 Manawatu and West Coast A. and P. Association: Palmerston North (Winter Show), 17th, 18th, 19th, and 20th June.

(Agricultural and Pastoral Association secretaries are invited to supply dates and location of their shows.)

British Market for Peas and Beans.—The following information was cabled by the High Commissioner, London, on 2nd February:—*Peas*—Arrivals of blue are heavy from Japan, but market firm and £23 per ton c.i.f. has been paid for February–March shipments; spot prices, Japanese, £21 15s.; Tasmanian, £22; New Zealand, £17 to £21. Demand for maple is limited and New Zealand stocks heavy; New Zealand, 73s. to 75s. per 504 lb.; Tasmanian, 90s. to 95s.; Tasmanian February shipments, nominal values 90s. c.i.f. English selling freely at 55s. to 65s. *Beans*—Market quiet; Home trade at 45s. to 50s. per quarter

IDENTIFICATION OF PUREBRED STOCK.

INQUIRIES continue to be received by the Department as to the best method of identification for purebred stock. The Director of the Live-stock Division unreservedly recommends the nose-print method, specimens of which—taken at the Wallaceville Veterinary Laboratory farm—were reproduced in the *Journal* for June last (pages 380, 381). This method is simple, and is not open to faking as is the case with brands. It can be used for cattle, sheep, and pigs. Under this system an animal can be bought on pedigree without having been seen, and identification established on receipt by taking a nose print and comparing it the one furnished by the seller.

INVENTIONS OF AGRICULTURAL INTEREST.

APPLICATIONS for patents, published with abridged specifications in the *New Zealand Patent Office Journal* of 24th January and 7th February, 1924, include the following of agricultural interest:—

Milking-machine teat-cup (G. S. Gordon, Helensville); appliance and process for cooling and aerating milk (J. W. Bott, Coalstown Lakes, Queensland); plough-strengthening device (R. Forsman, Gordonton); harrow (Farmers' Co-operative Motor and Wheelwright Co., Ltd. (Morrinsville); cream-separator driving-gear (C. F. Shaw, Rawene); reinforced concrete fencing-elements (W. G. Grant, Otorohanga); sheep-shearing-machine-gear control (J. D. Morrison, Greytown); grass- and clover-seed stripper-beaters (J. E. Holland, Christchurch); animal-skinning apparatus (Société Industrielle de Dépouille Mécanique des Animaux, Paris); milking-machine teat-cup holder (A. M. Hooker, Carterton); cream-testing bottle (M. L. Rogers, Rangiwahia); milking-machine (C. L. Piner, Belfast); milk-can-filling distributor (O. W. Rowe, Whakamara); churn (R. W. Ashcroft, Auckland); milking-machine valve (J. G. Swanson, Masterton); carcass-tail securing appliance during freezing-process (F. Lomas, Murtoa, Victoria); milking-machine milk-measuring appliance (J. W. Fuge, Featherston).

Copy of full specification and drawings in respect of any of the above may be obtained from the Registrar of Patents, Wellington, price 1s.

ESTIMATED YIELDS OF WHEAT AND OAT CROPS.

THE following estimated average yields per acre of wheat and oats for the season 1923-24 have been compiled by the Government Statistician from reports furnished by Inspectors of the Department of Agriculture throughout the Dominion, and issued under date 5th February:—

District.					Wheat. Bushels per Acre.	Oats. Bushels per Acre.
North Island	..	..	..	..	24·83	27·75
Nelson	..	..	..	..	21·07	24·00
Marlborough	..	..	..	..	24·86	33·53
Canterbury	..	..	..	..	22·72	27·12
Otago	..	..	..	..	23·92	26·81
Southland	..	..	..	..	30·51	37·60
Average (estimated) for the Dominion, season 1923-24					23·27	29·66
Average (actual) for the Dominion, season 1922-23					30·44	39·74

In accordance with the above estimates, the total yield of wheat for the Dominion should be approximately 4,250,000 bushels, as against an actual yield of 8,395,023 bushels for the season 1922-23 (when also a greater acreage was sown).

The percentage of oat crop threshed for the five seasons ending with 1922-23 was 31·69 of the total area under that crop. Assuming that a similar proportion is threshed this year, the total yield of grain should be approximately 4,200,000 bushels, as against an actual yield of 5,688,157 bushels for the season 1922-23.